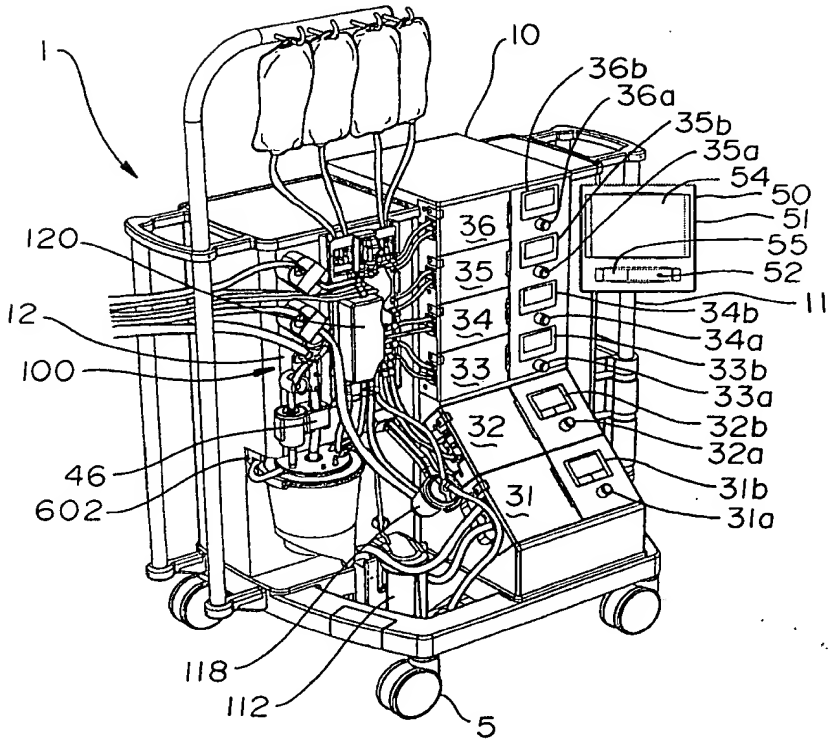
Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

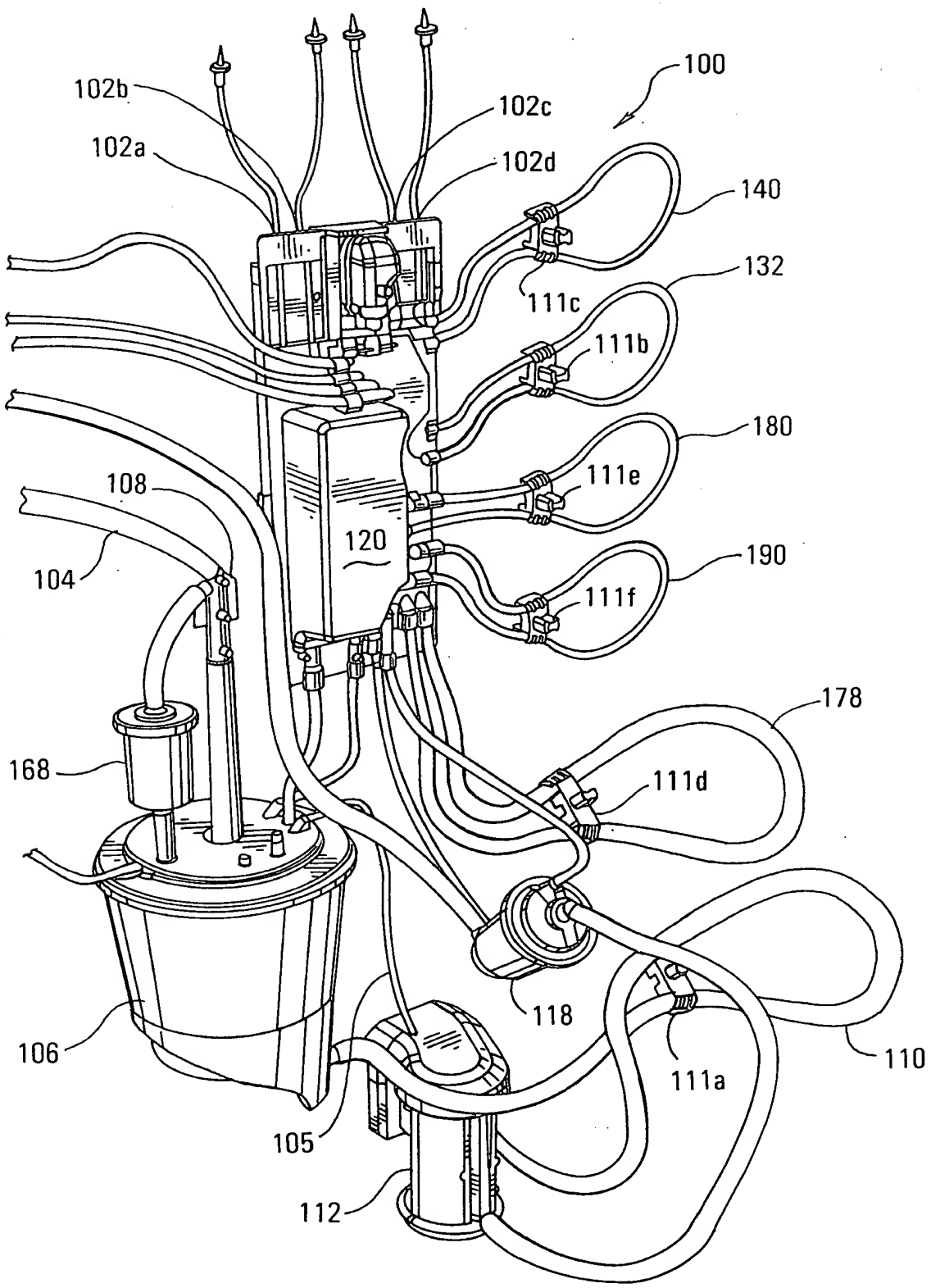
#4

Fig. 1



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 2A



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 2B

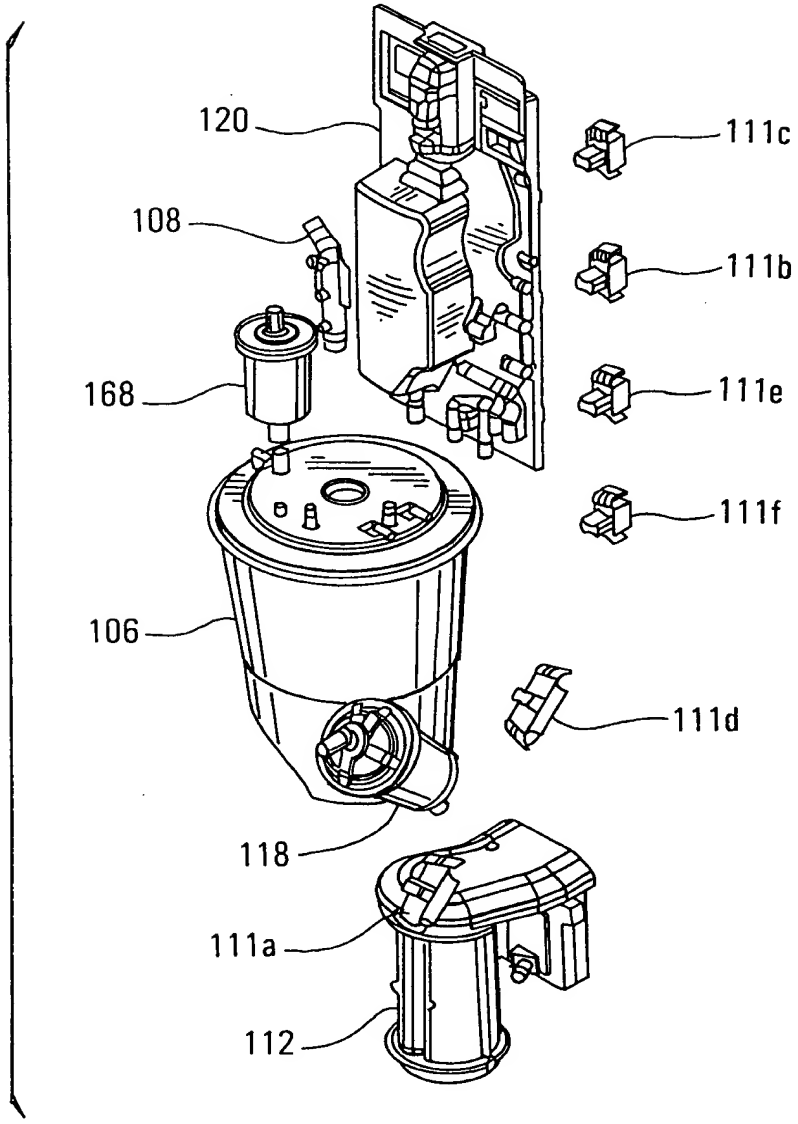


Fig.3A

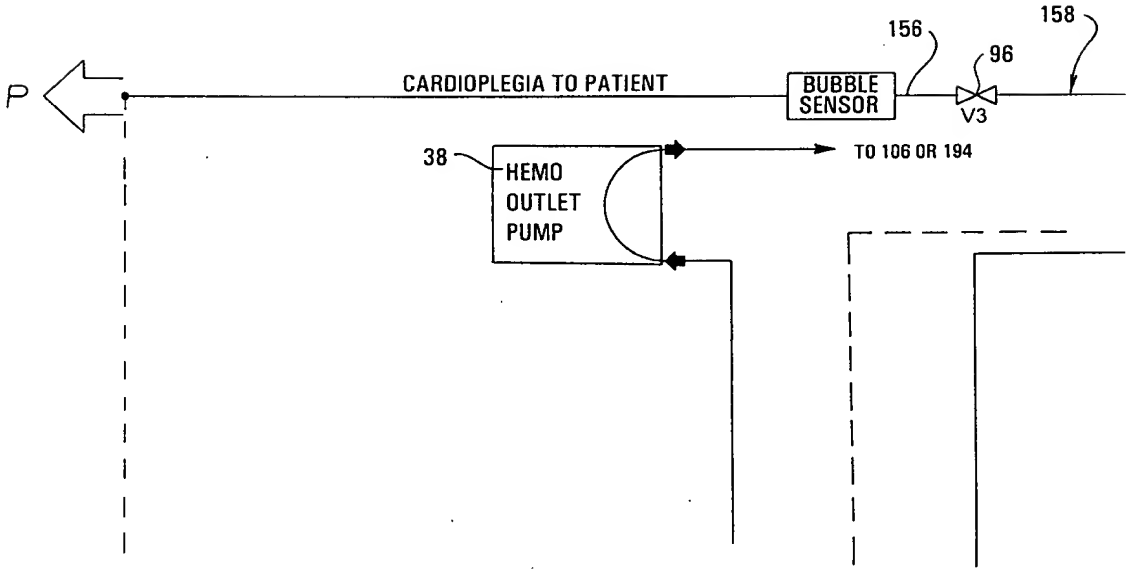
Fig.3A-1	*Fig.3A-2*
Fig.3A-3	*Fig.3A-4*

Fig.3B

Fig.3B-1	*Fig.3B-2*
Fig.3B-3	*Fig.3B-4*

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig.3B-1



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig.3B-2

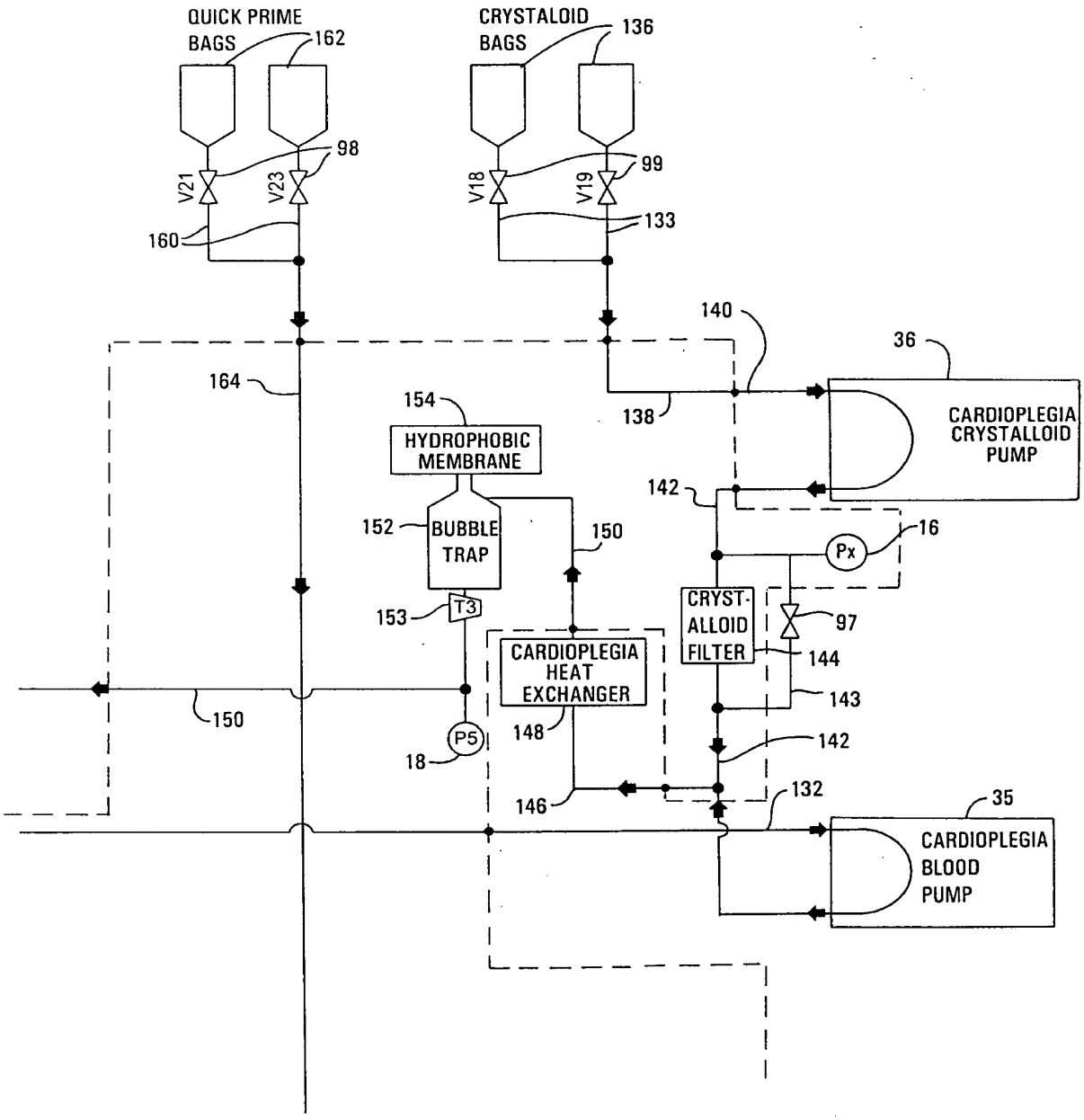
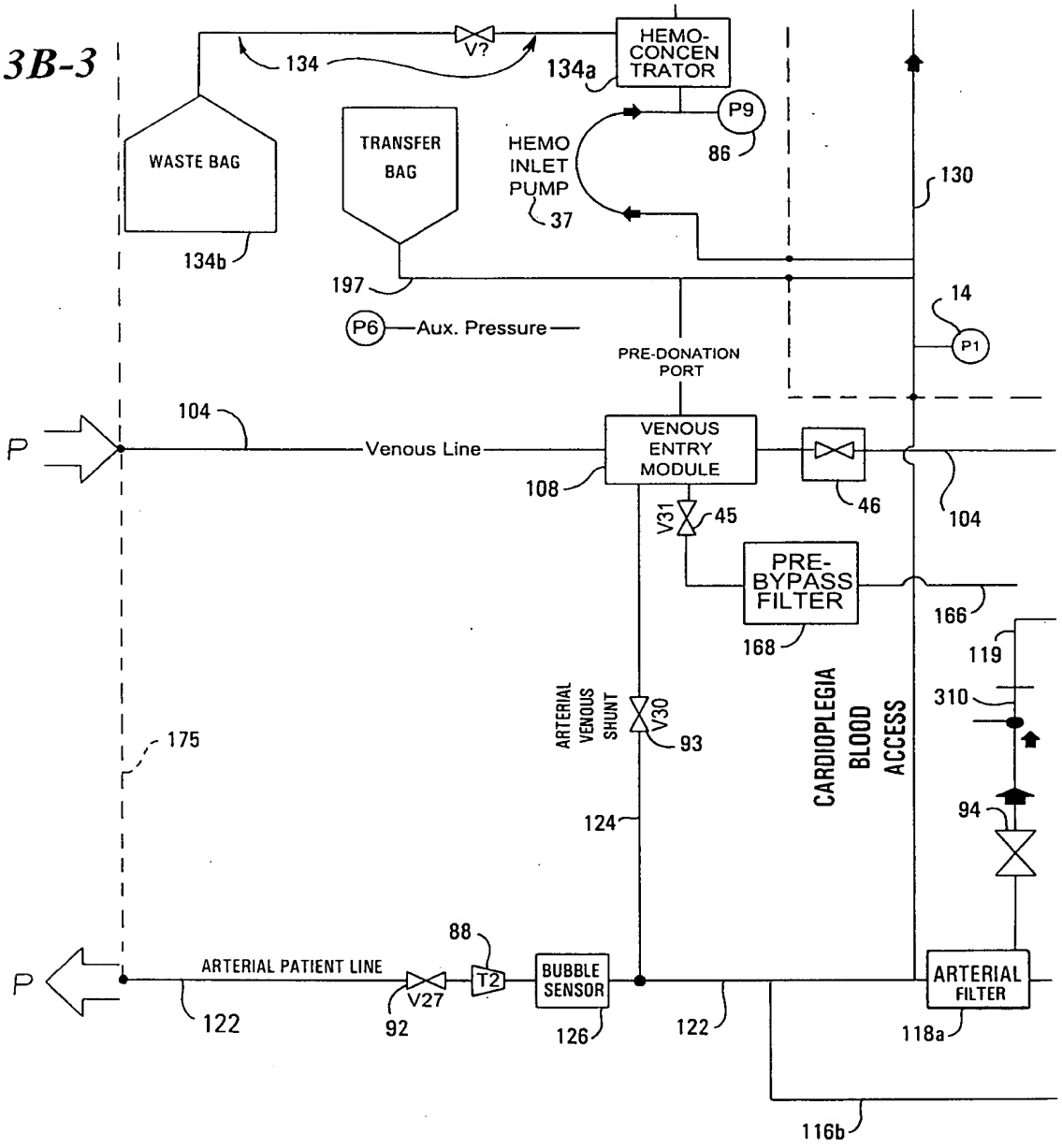
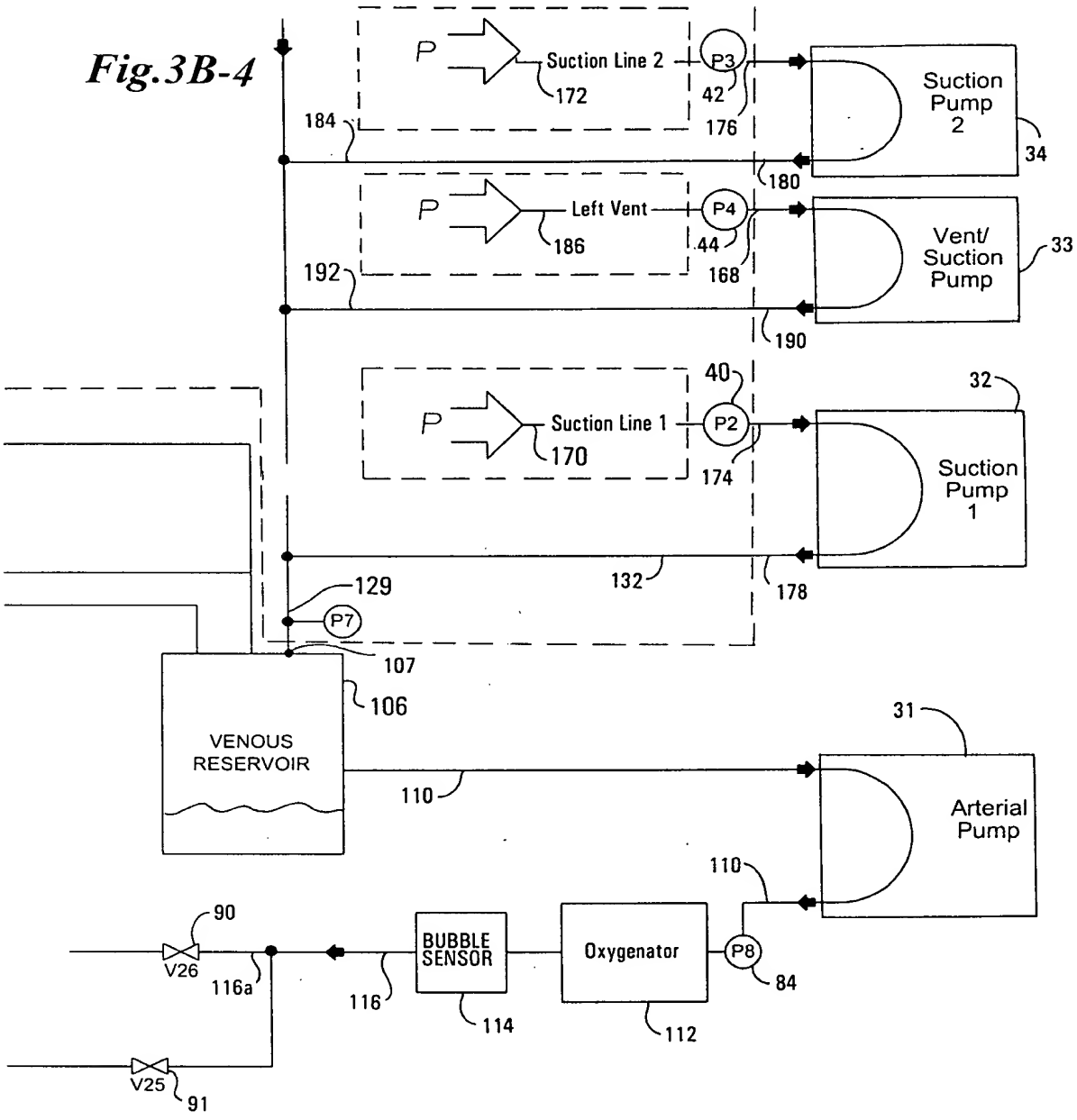


Fig.3B-3


HEMO-CONCEN TRATOR
134a
V?
134
WASTE BAG
134b
TRANSFER BAG
197
HEMO INLET PUMP
37
P9
86
130
14
P1
P6
Aux. Pressure
PRE-DONATION PORT
104
Venous Line
VENOUS ENTRY MODULE
108
V31
45
46
104
PRE-BYPASS FILTER
168
166
119
310
ARTERIAL VENOUS SHUNT
V30
93
175
124
CARDIOPLEGIA BLOOD ACCESS
94
88
T2
ARTERIAL PATIENT LINE
V27
92
BUBBLE SENSOR
126
122
122
ARTERIAL FILTER
118a
116b

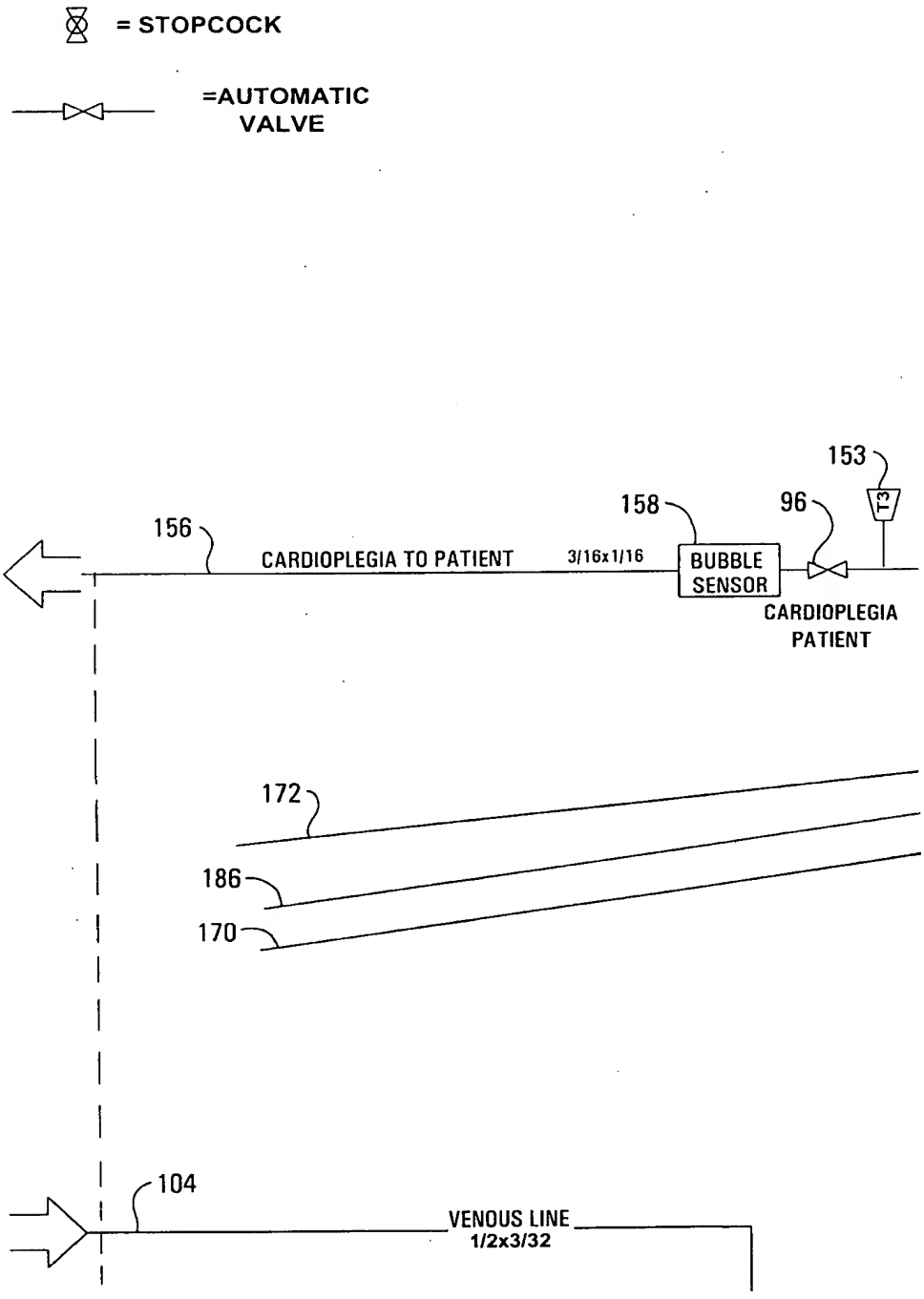
Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig.3B-4



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig.3A-1



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig.3A-2

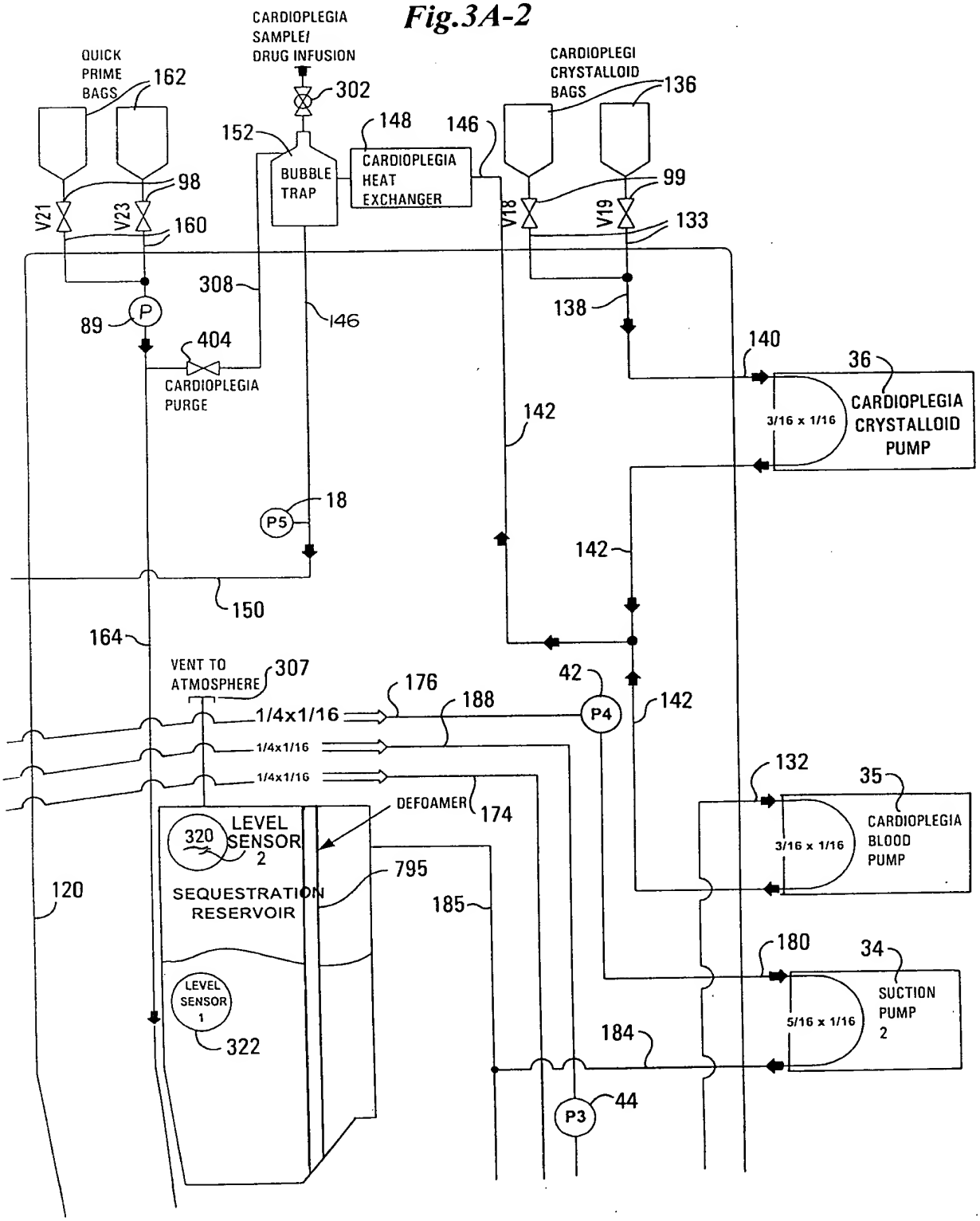


Fig.3A-3

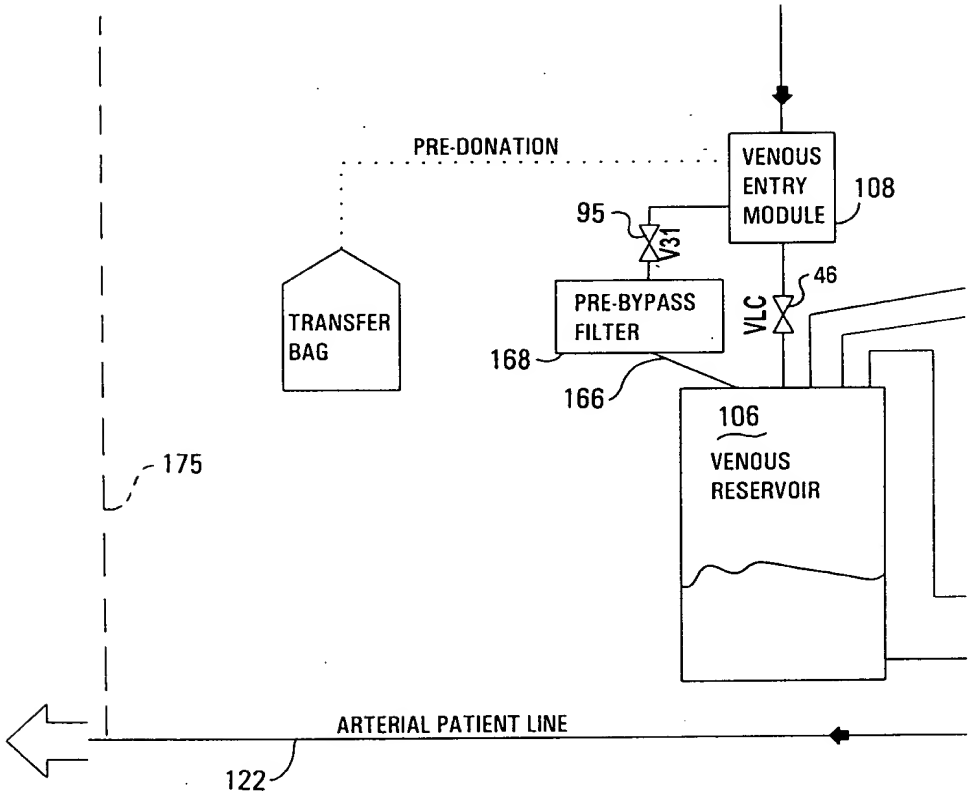
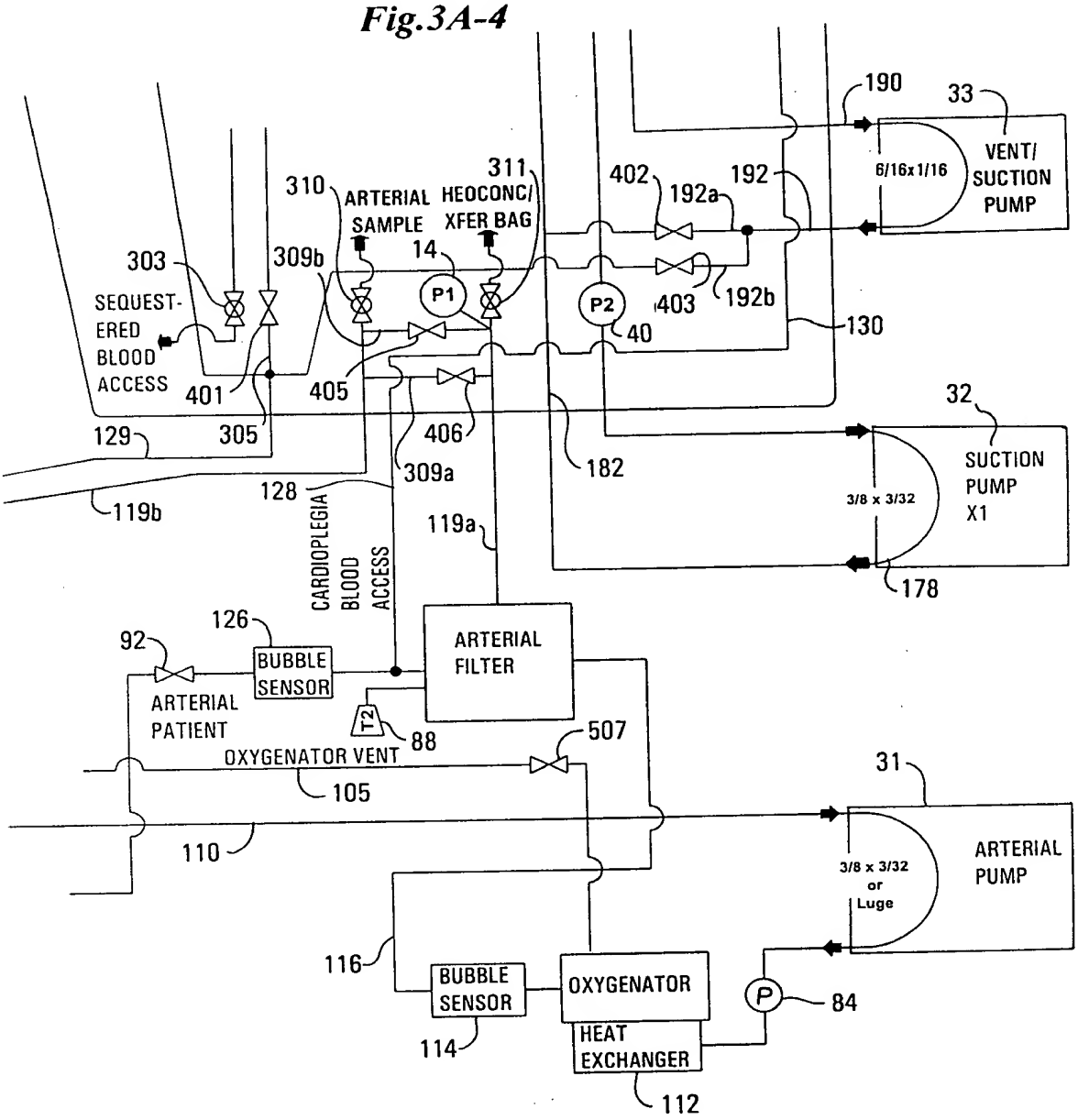

PRE-DONATION
VENOUS ENTRY MODULE
108
95
V31
46
VLC
PRE-BYPASS FILTER
TRANSFER BAG
168
166
106
VENOUS RESERVOIR
175
ARTERIAL PATIENT LINE
122

Fig.3A-4


190
33
VENT/
SUCTION
PUMP
6/16x1/16
402
192a
192
310
ARTERIAL
SAMPLE
311
HEOCONC/
XFER BAG
14
303
309b
SEQUEST-
ERED
BLOOD
ACCESS
401
305
129
119b
405
406
309a
128
CARDIOPLEGIA
BLOOD
ACCESS
P1
P2
403
192b
40
130
182
32
SUCTION
PUMP
X1
3/8 x 3/32
178
119a
126
92
BUBBLE
SENSOR
ARTERIAL
PATIENT
ARTERIAL
FILTER
T2
88
507
OXYGENATOR VENT
105
31
110
3/8 x 3/32
or
Luge
ARTERIAL
PUMP
116
BUBBLE
SENSOR
114
OXYGENATOR
HEAT
EXCHANGER
P
84
112

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 4

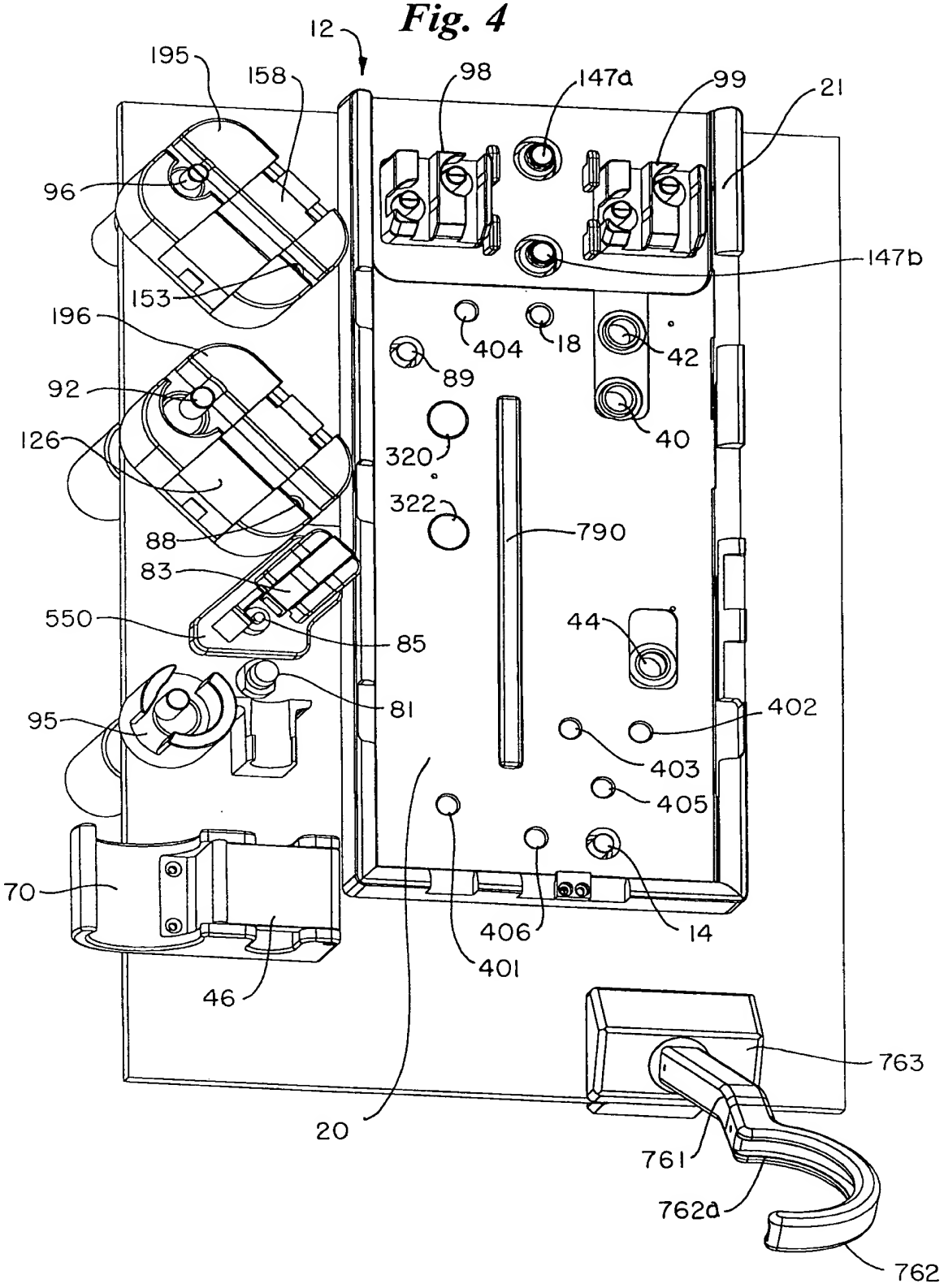


Fig. 5A

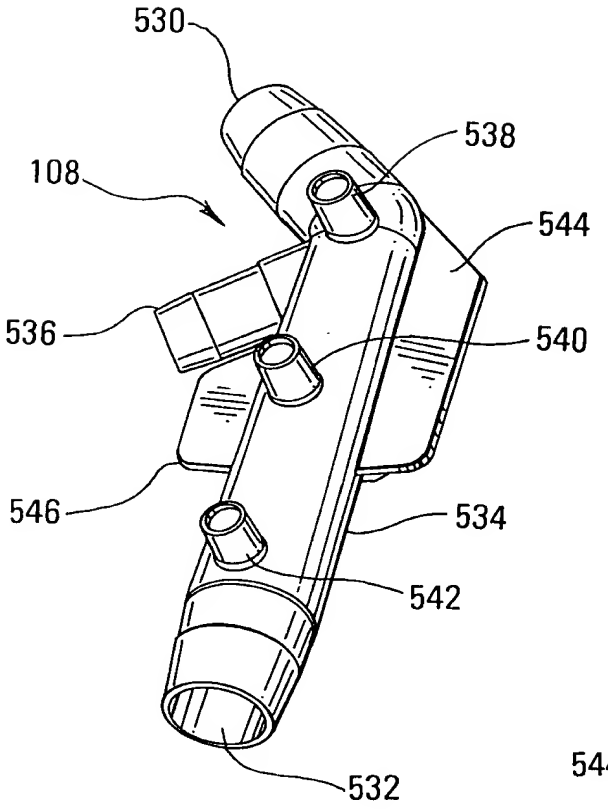

530
538
108
544
536
540
546
534
542
532

Fig. 5B

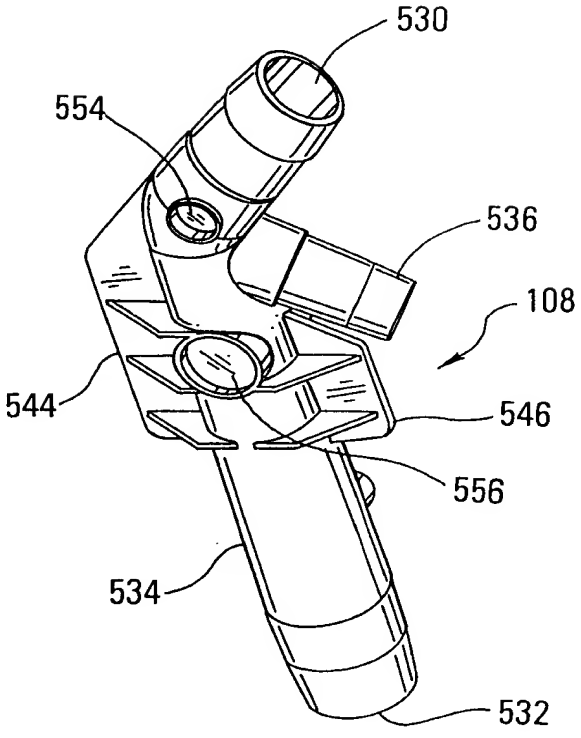

530
554
536
108
544
546
556
534
532

Fig. 5D

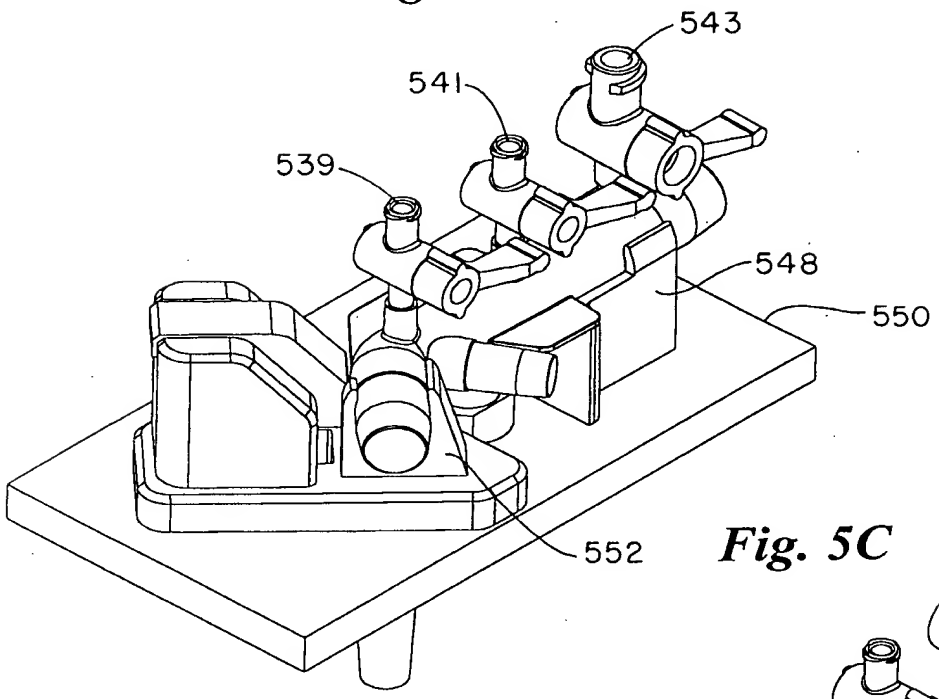
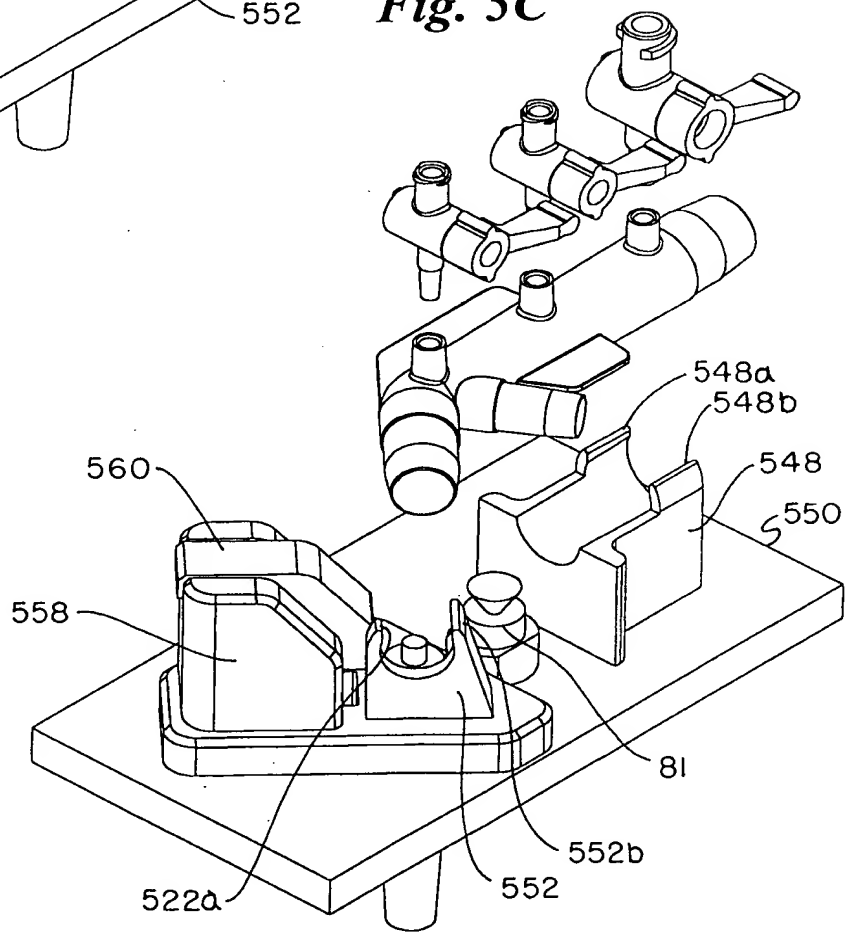

543
541
539
548
550
552

Fig. 5C


548a
548b
548
550
560
558
81
552b
552
522a

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 5E

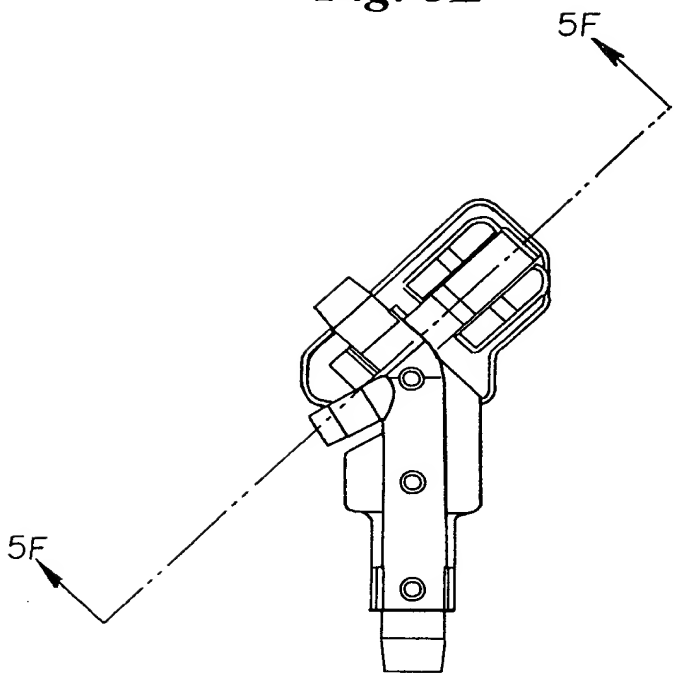
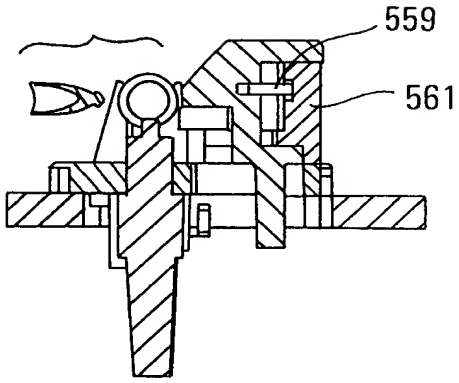


Fig. 5F



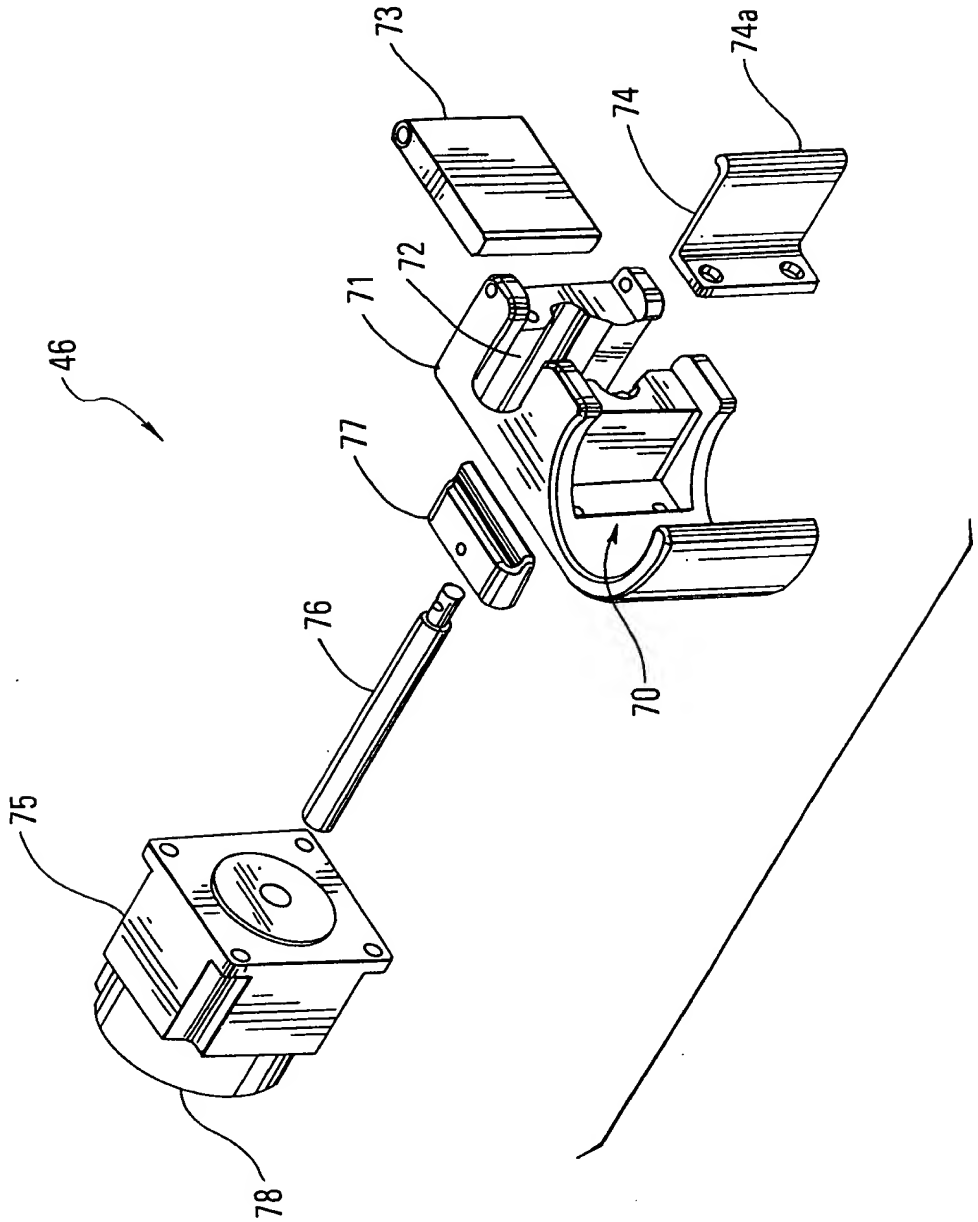


Fig. 6A

Fig. 6B

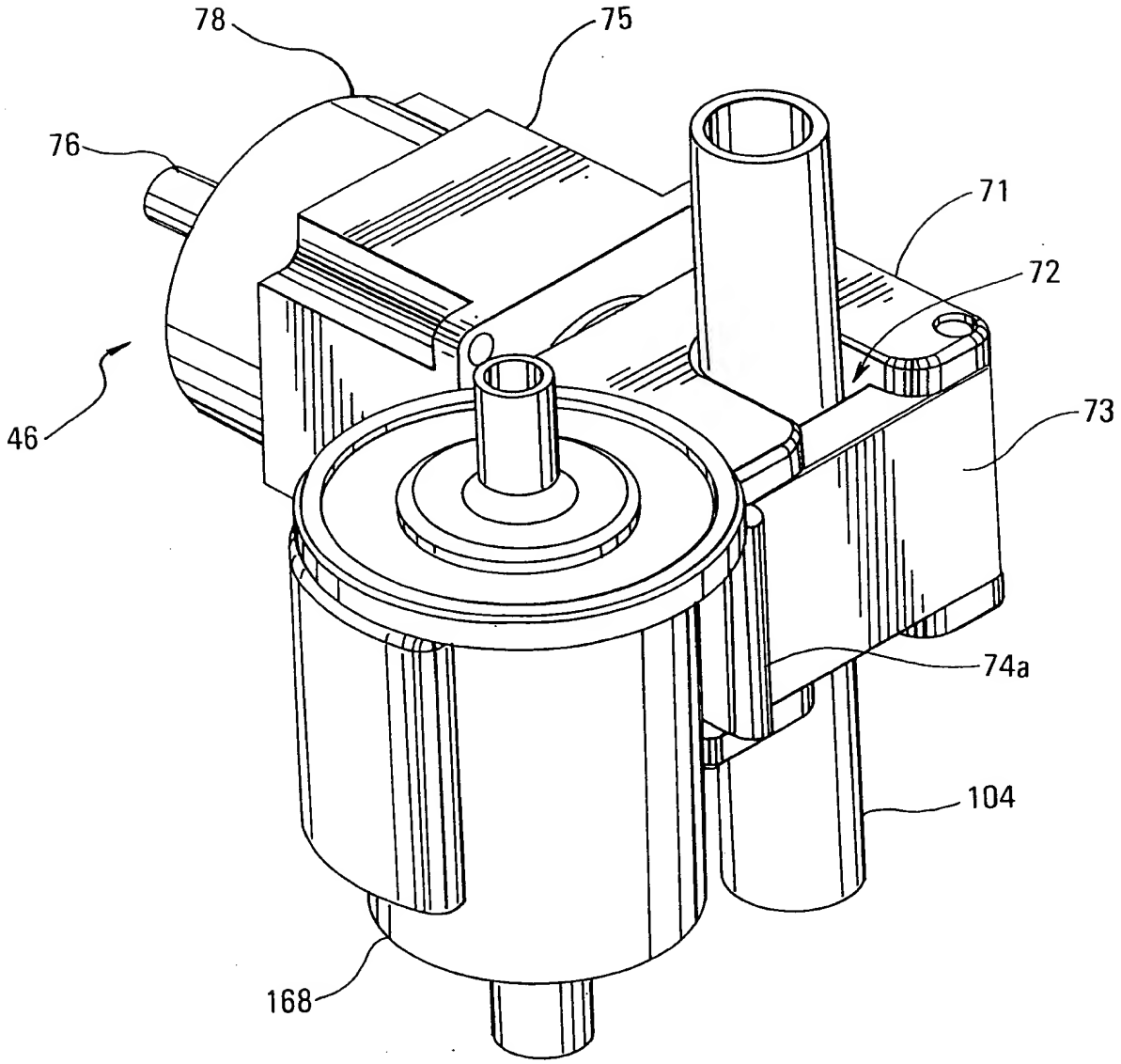


Fig. 6C

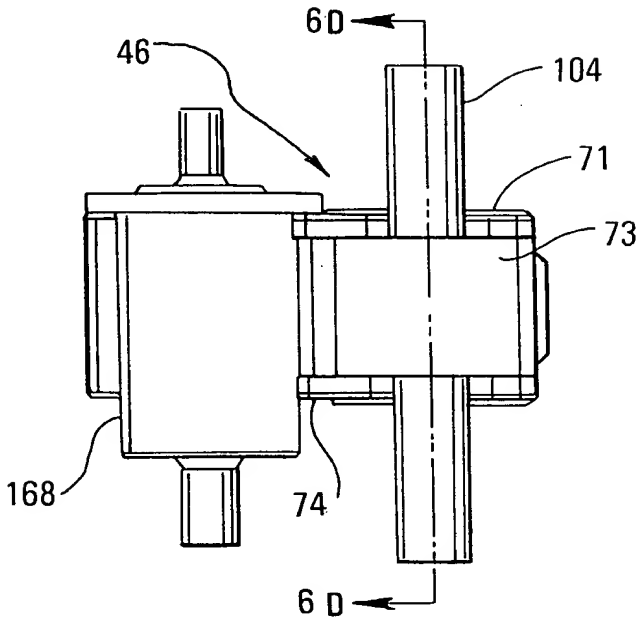


Fig. 6D

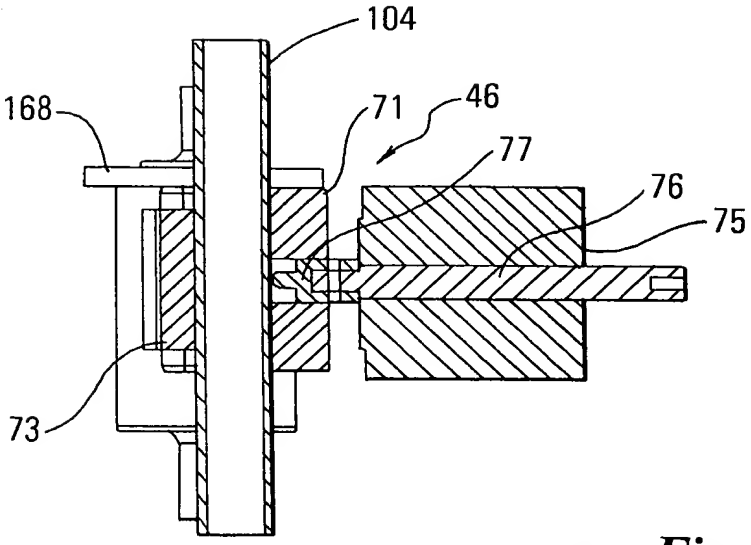


Fig. 6E

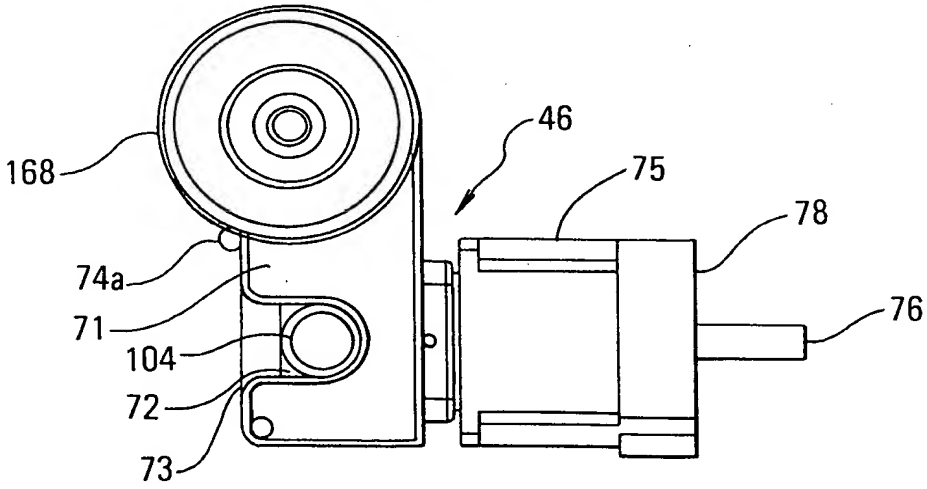


Fig. 7A

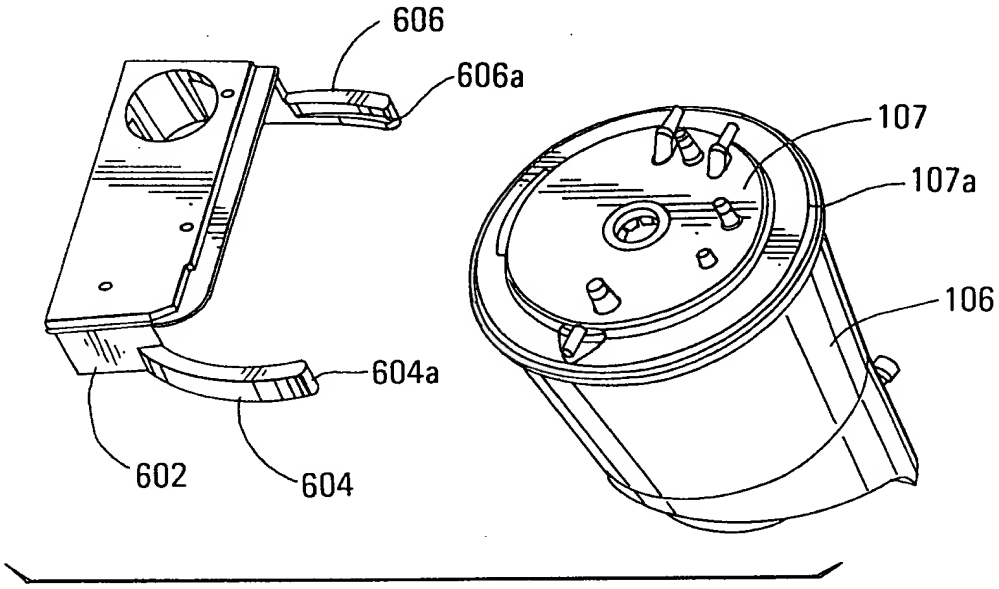
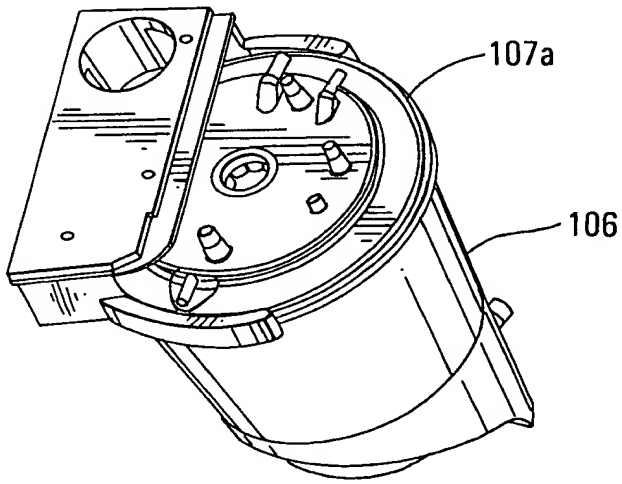
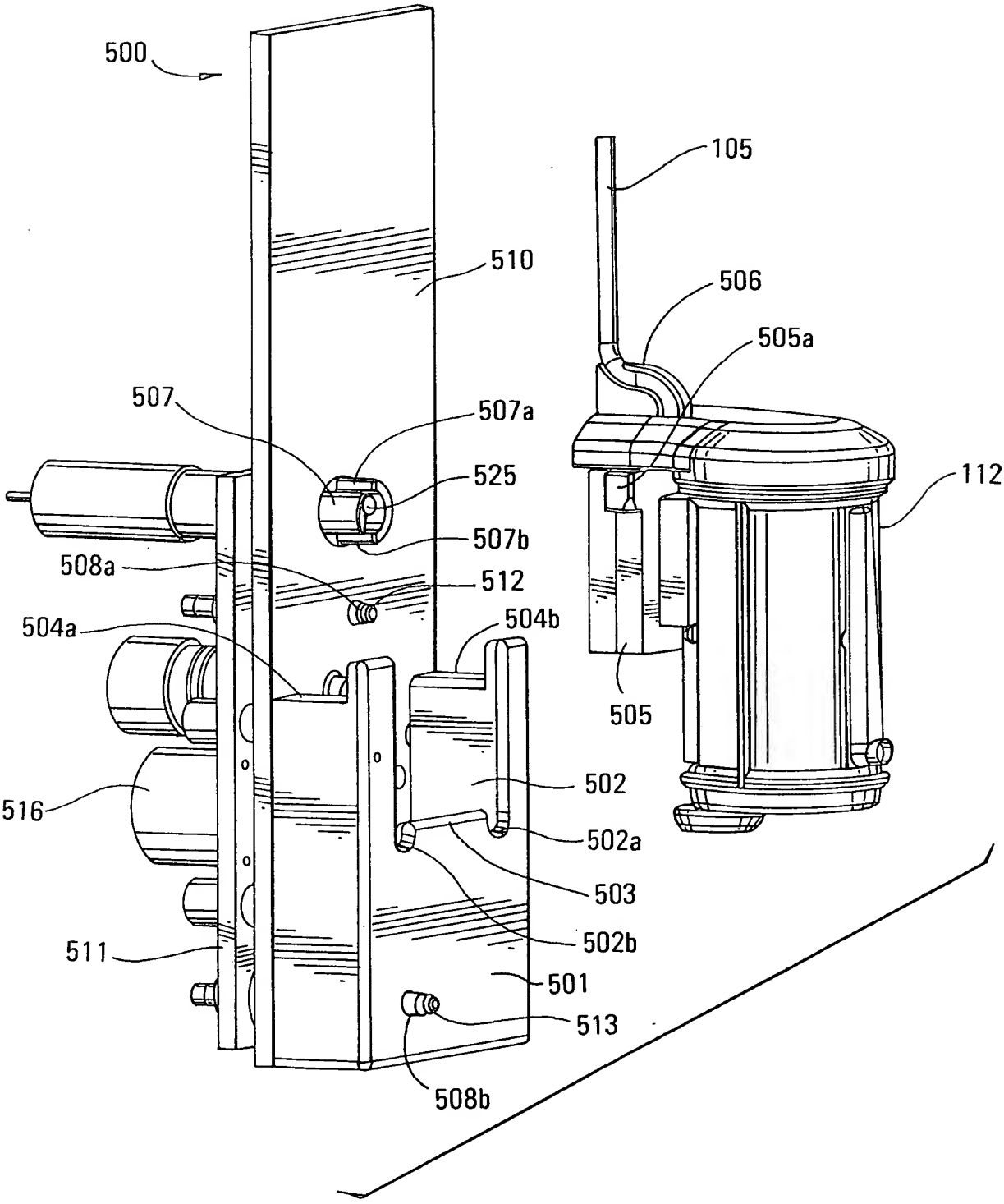


Fig. 7B



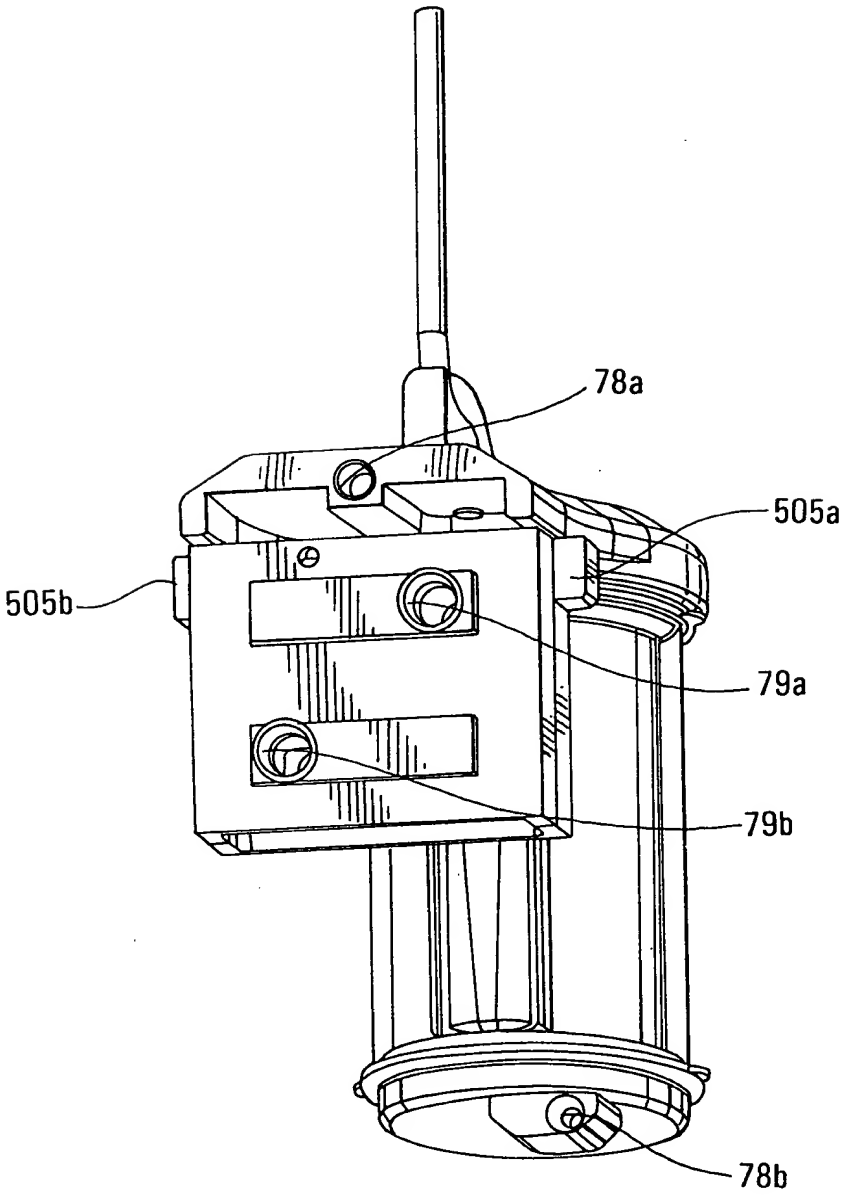
Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 8A



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 8B



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 8C

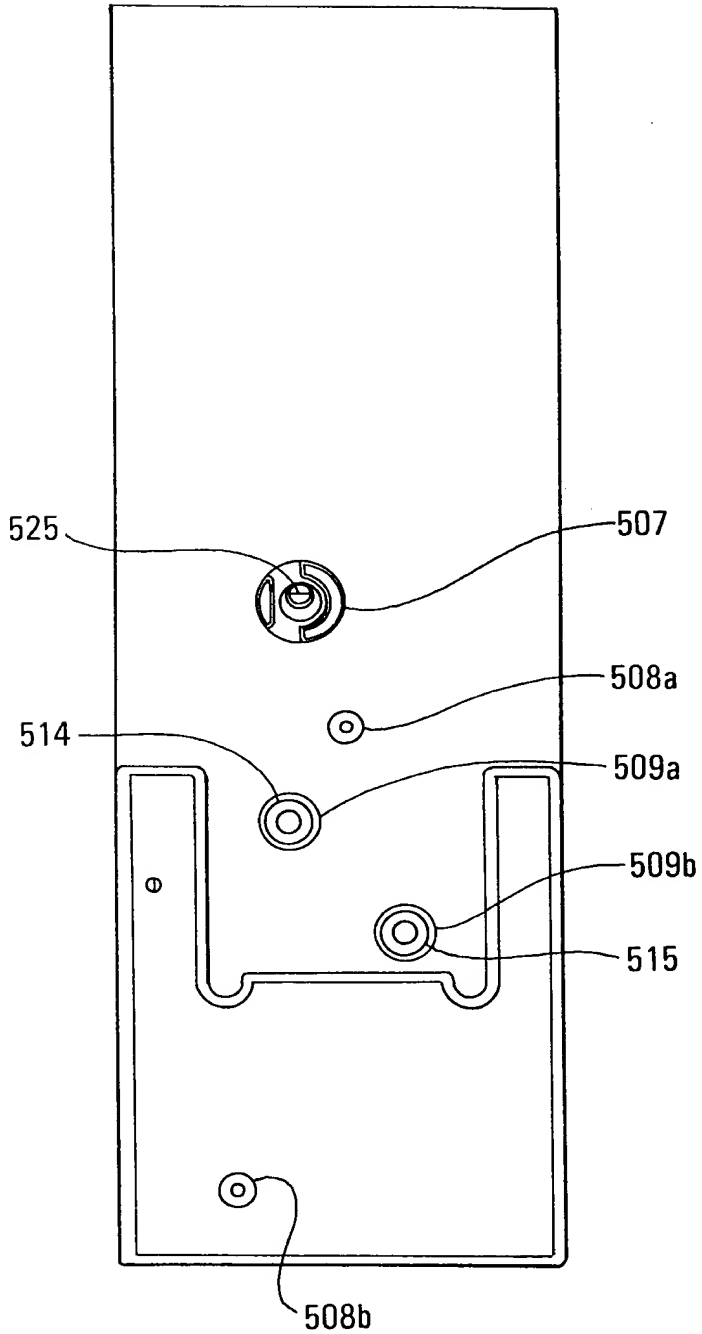
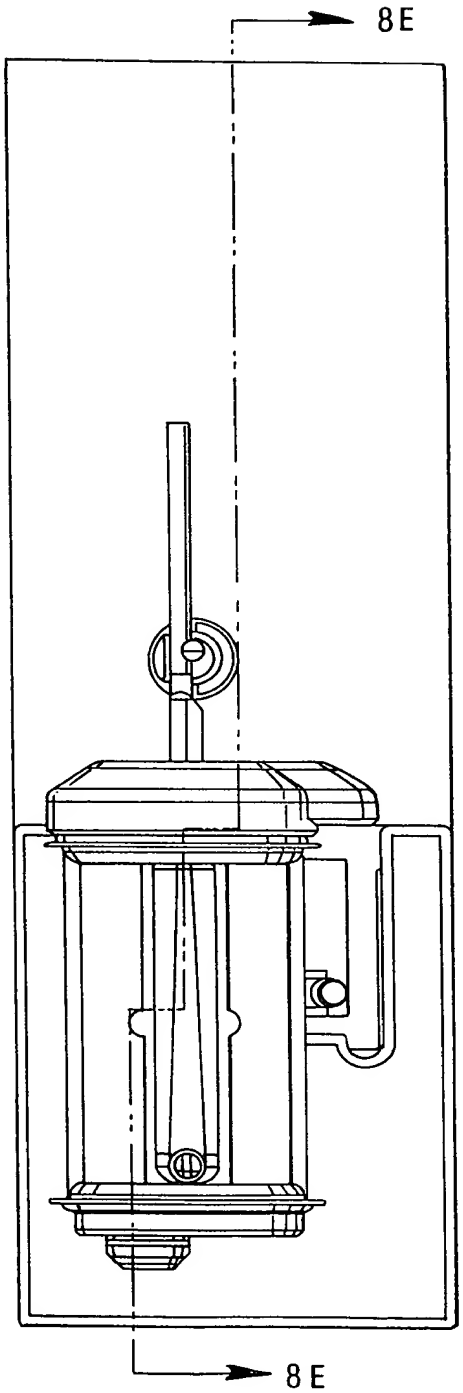


Fig. 8D



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 8E

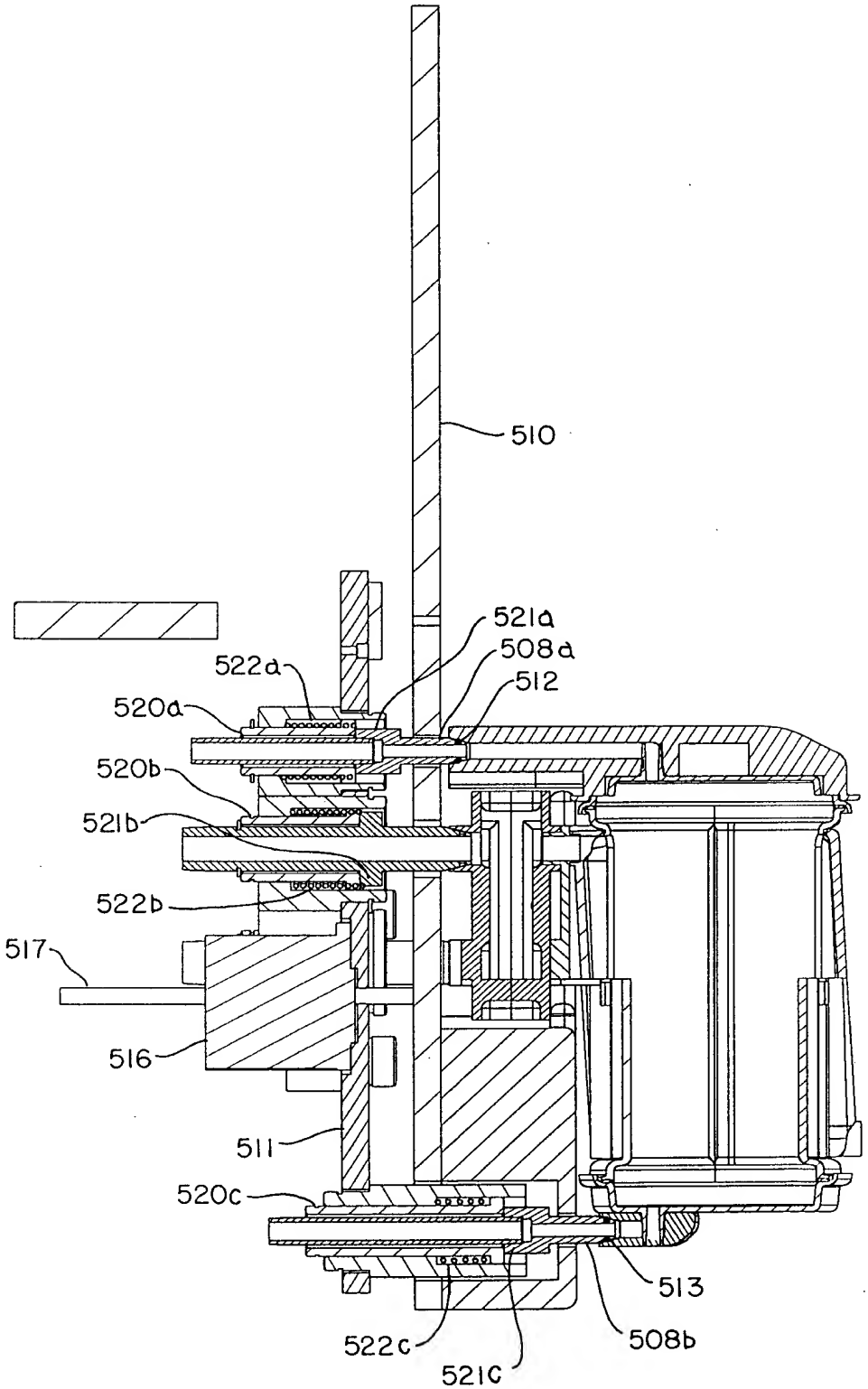


Fig. 9A

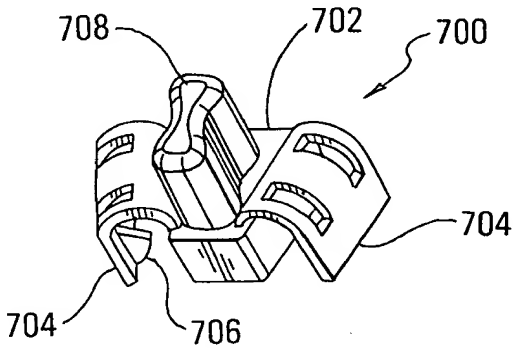


Fig. 9B

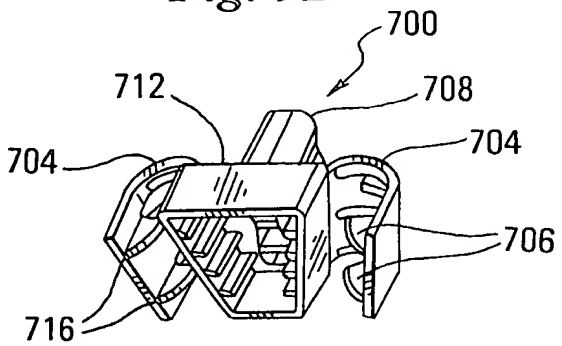


Fig. 9C

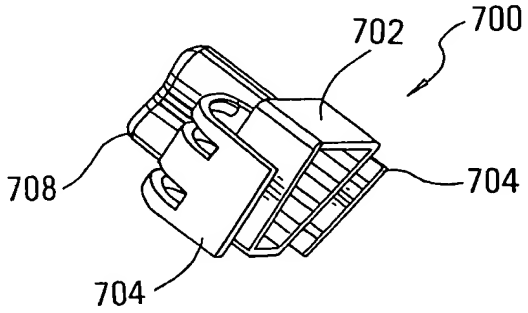


Fig. 9D

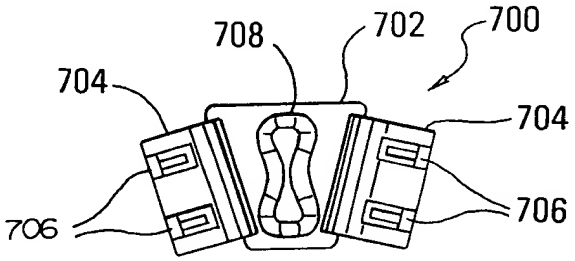


Fig. 9E

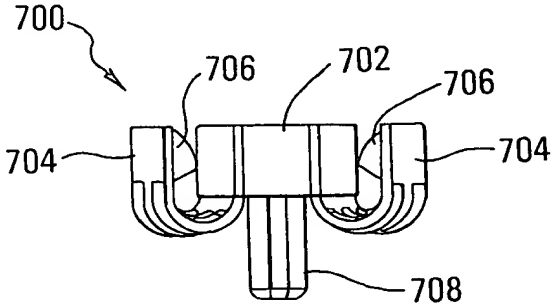
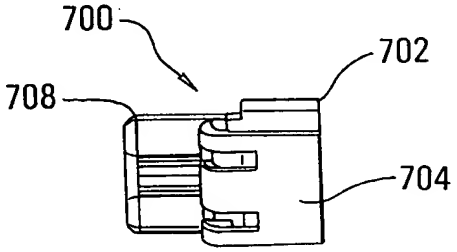


Fig. 9F



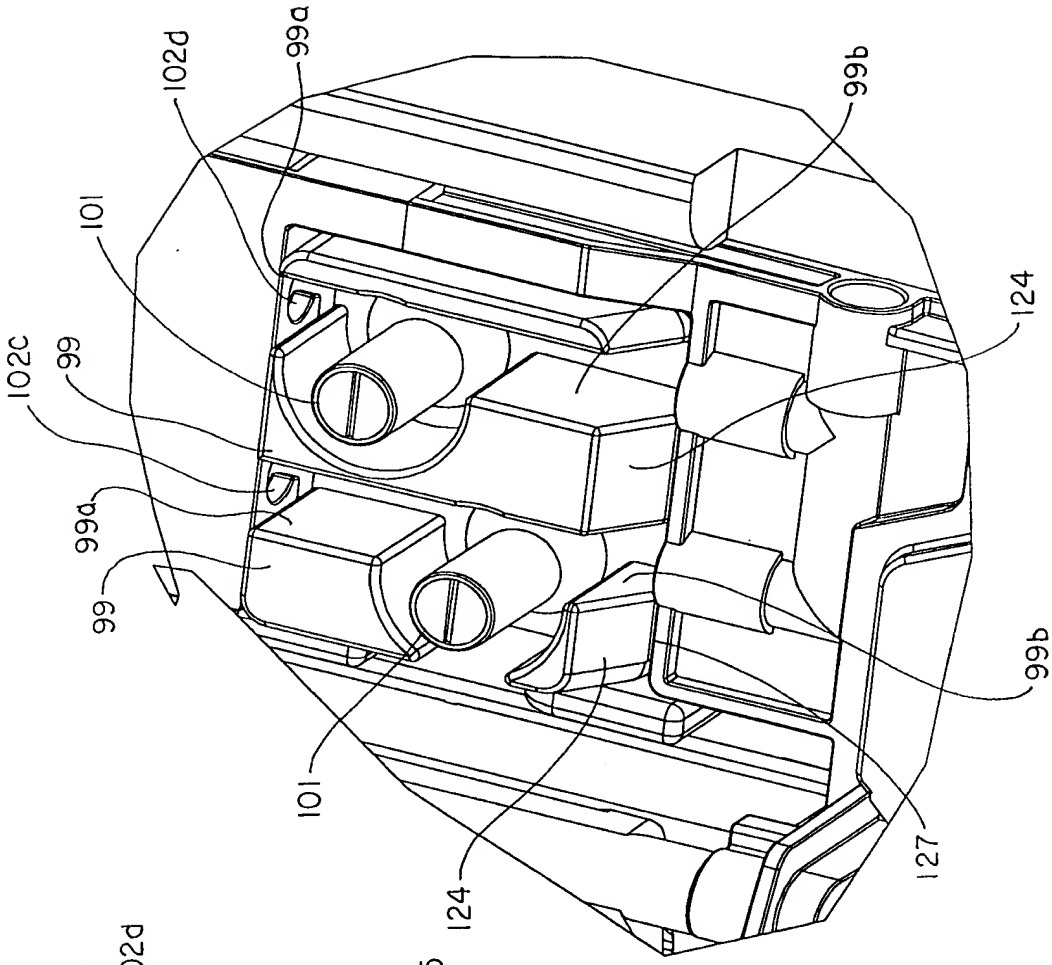


Fig. 10B

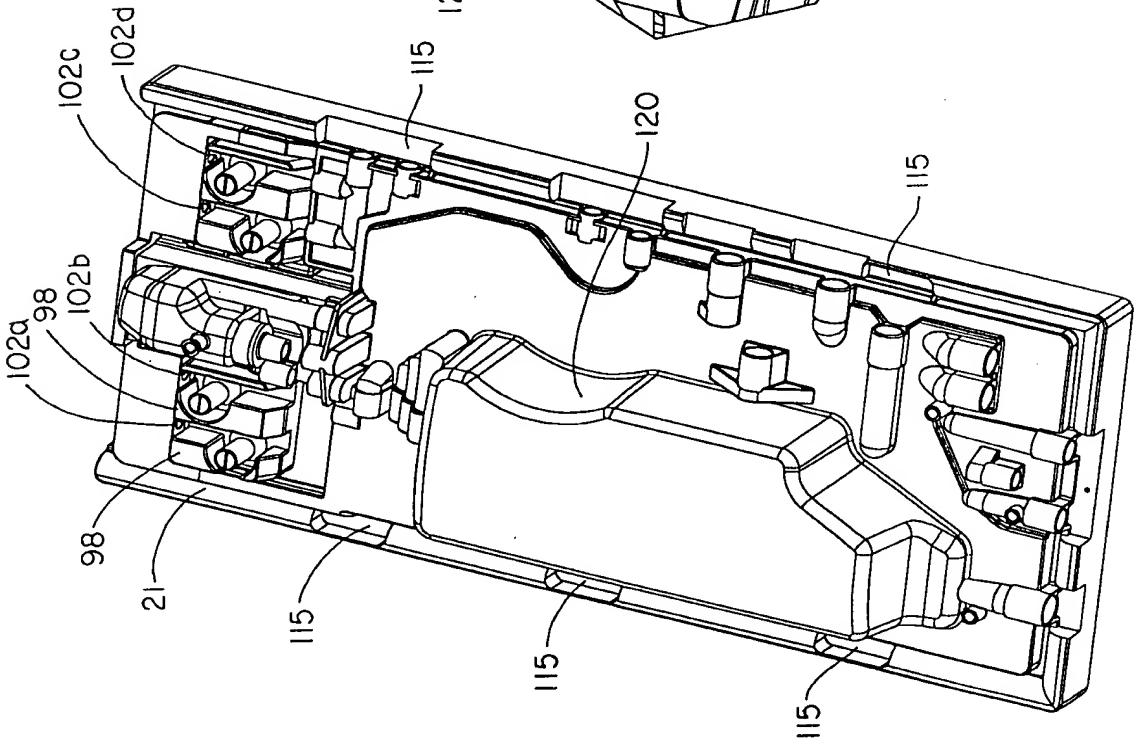


Fig. 10A

Fig. 10D

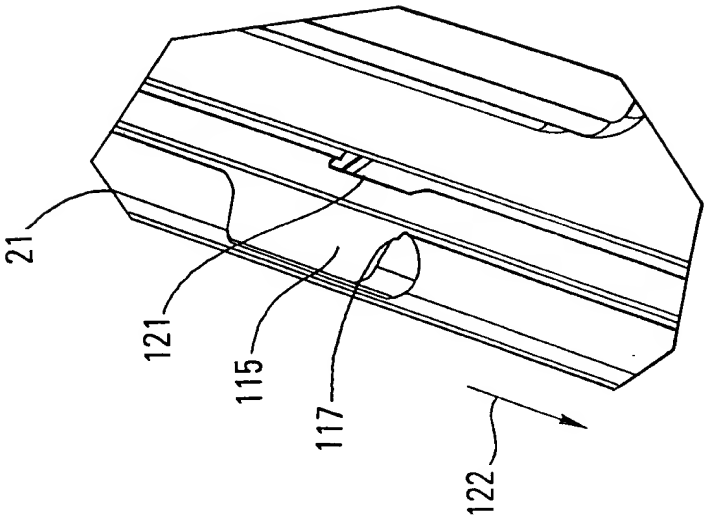
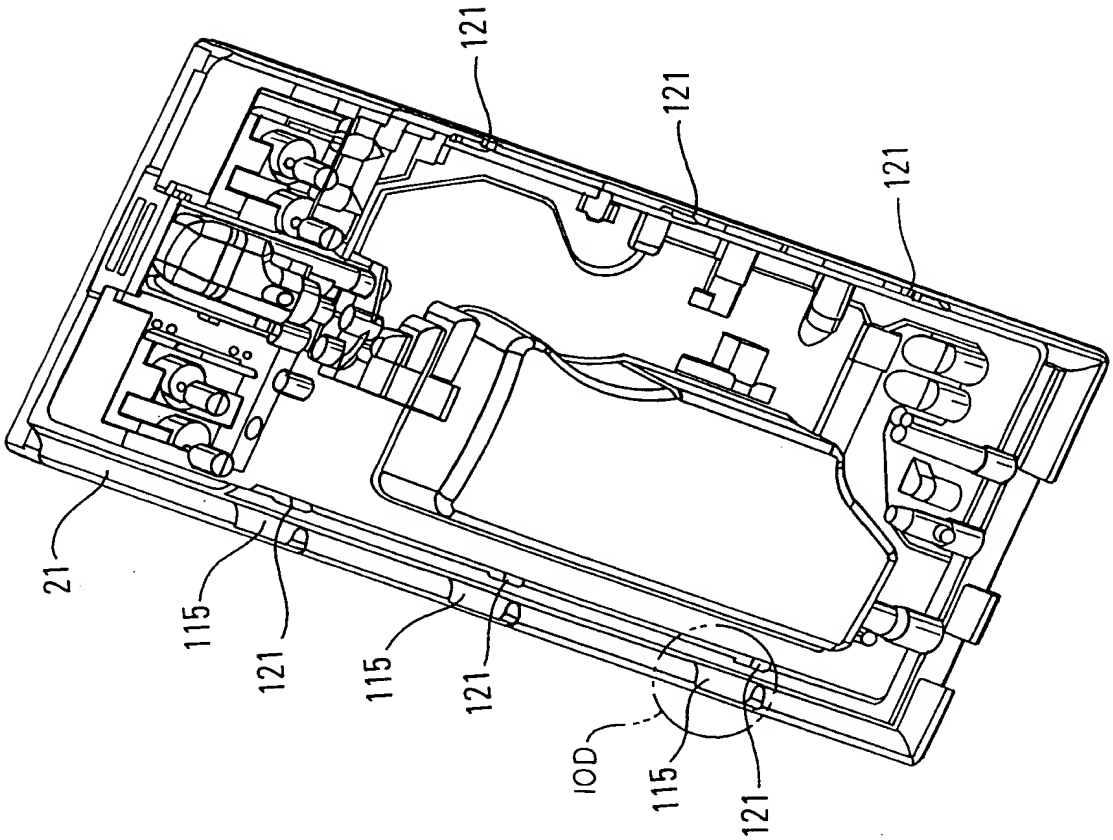


Fig. 10C



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 11

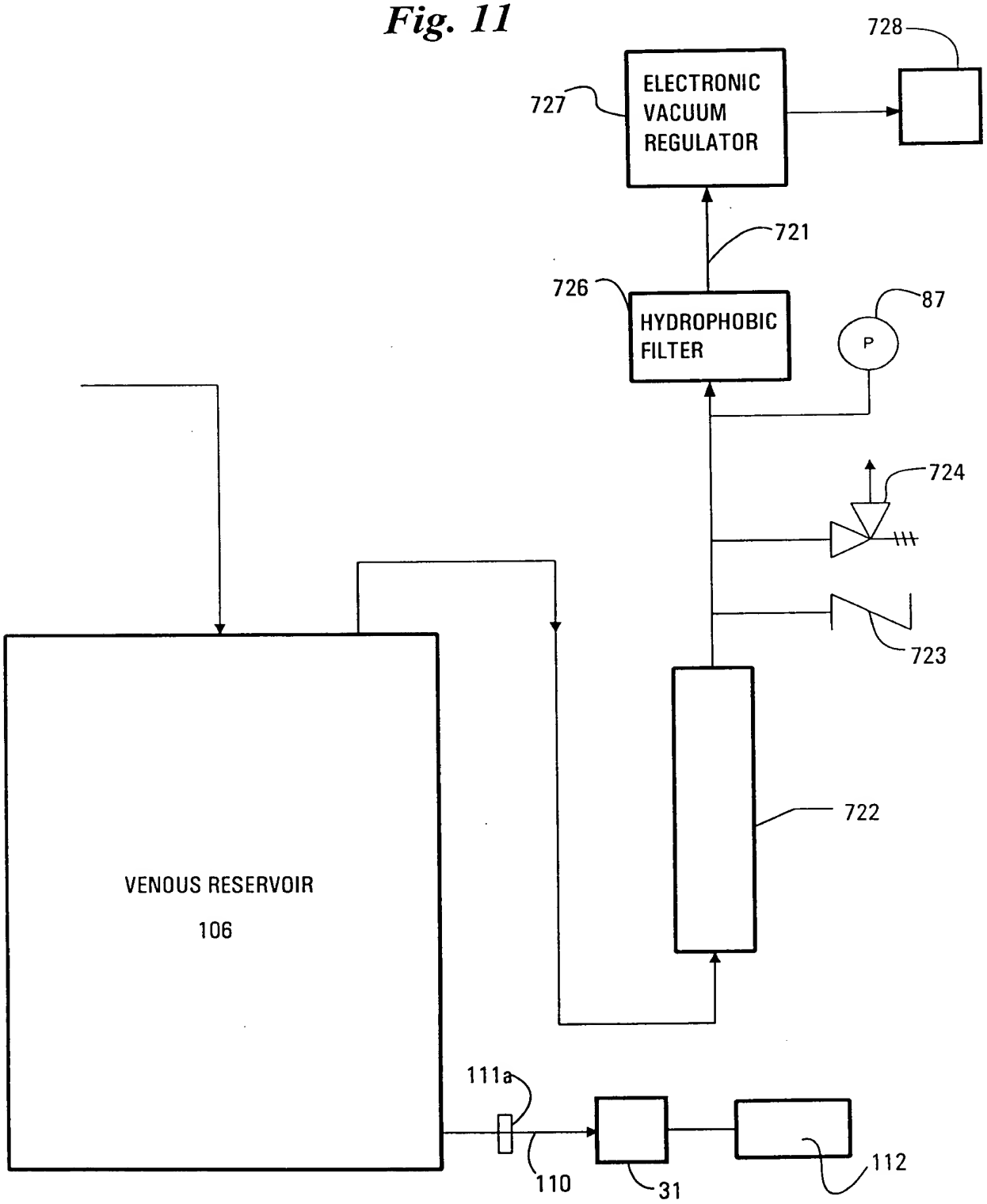


Fig. 12

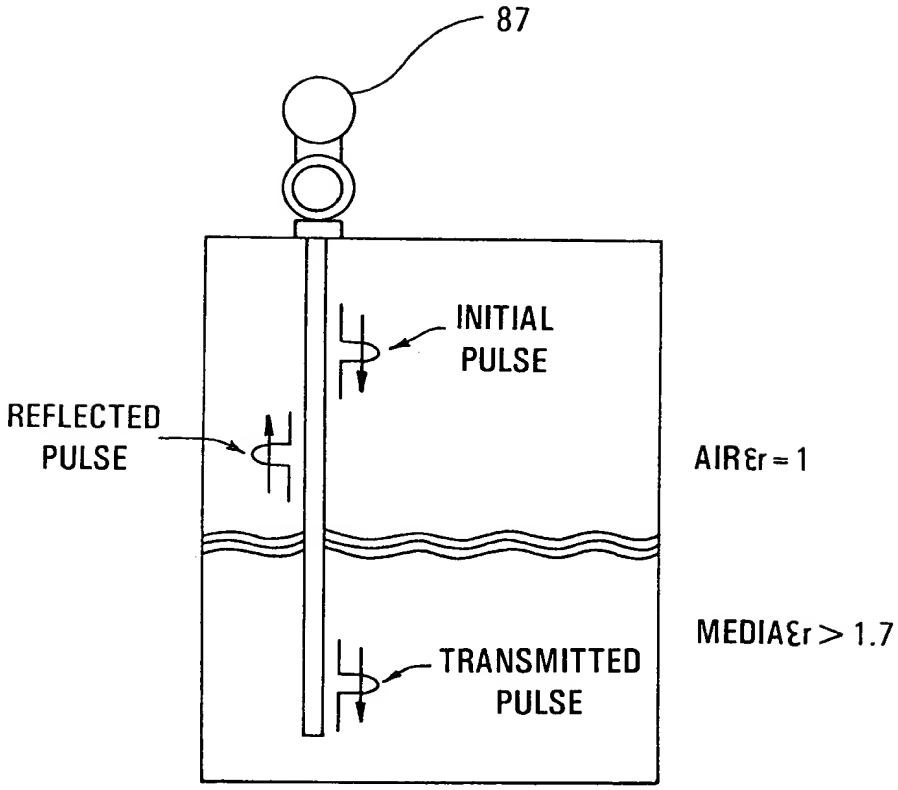
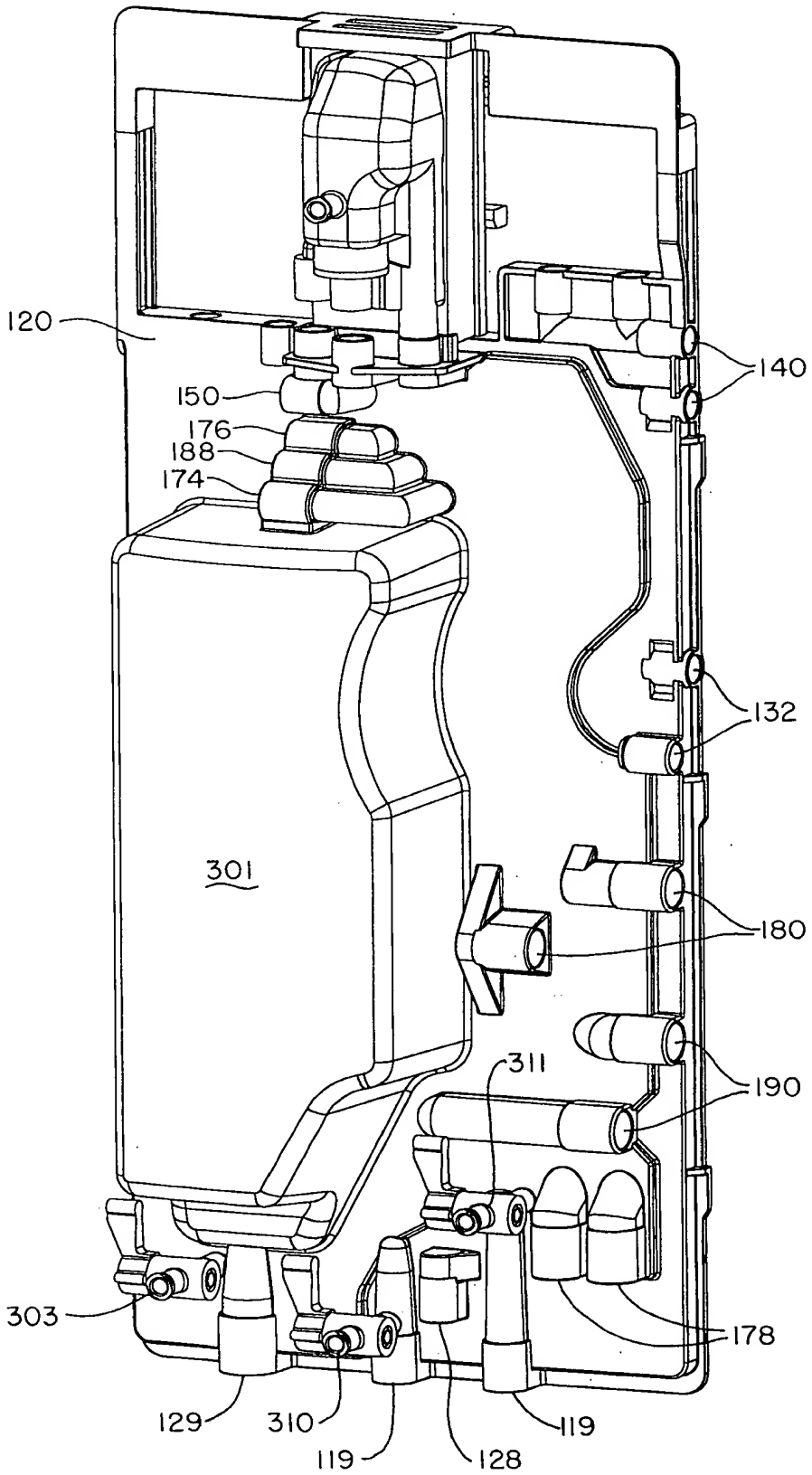
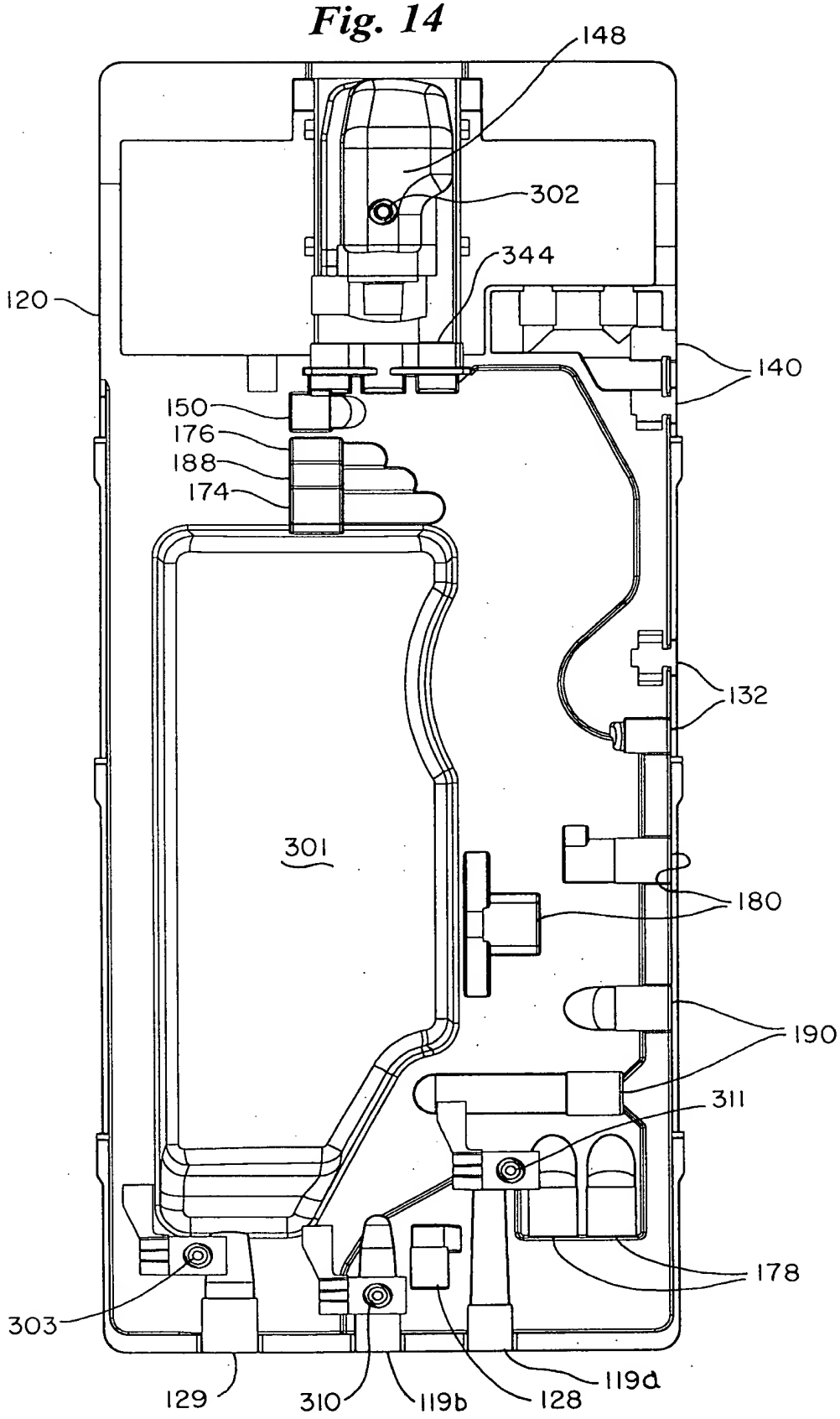

87
INITIAL PULSE
REFLECTED PULSE
AIR εr = 1
MEDIA εr > 1.7
TRANSMITTED PULSE

Fig. 13


120
140
150
176
188
174
132
301
180
311
190
303
178
129
310
119
128
119

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 14



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 15

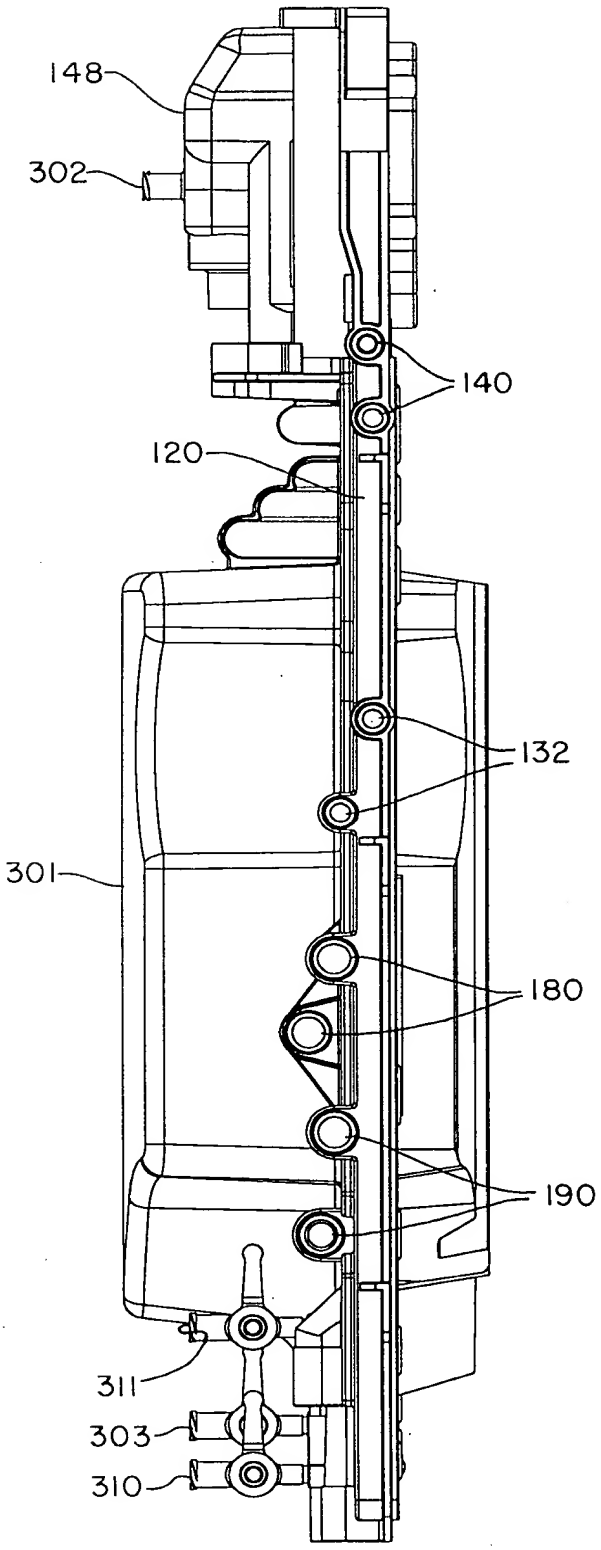


Fig. 16

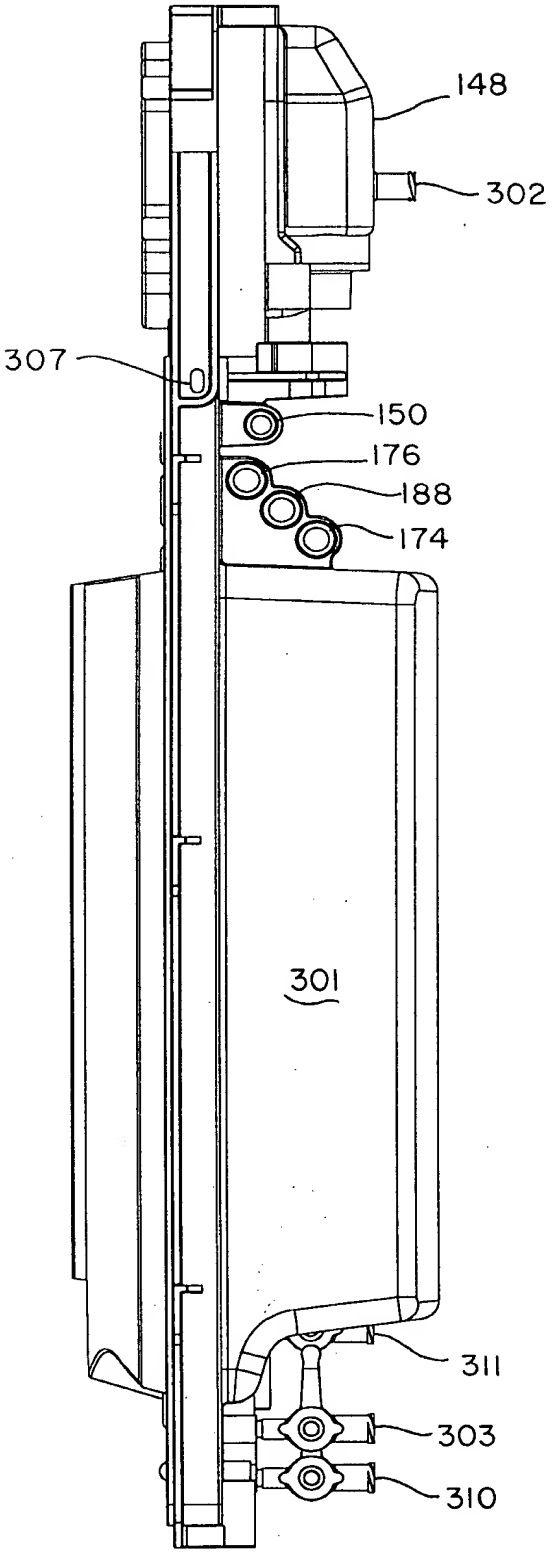
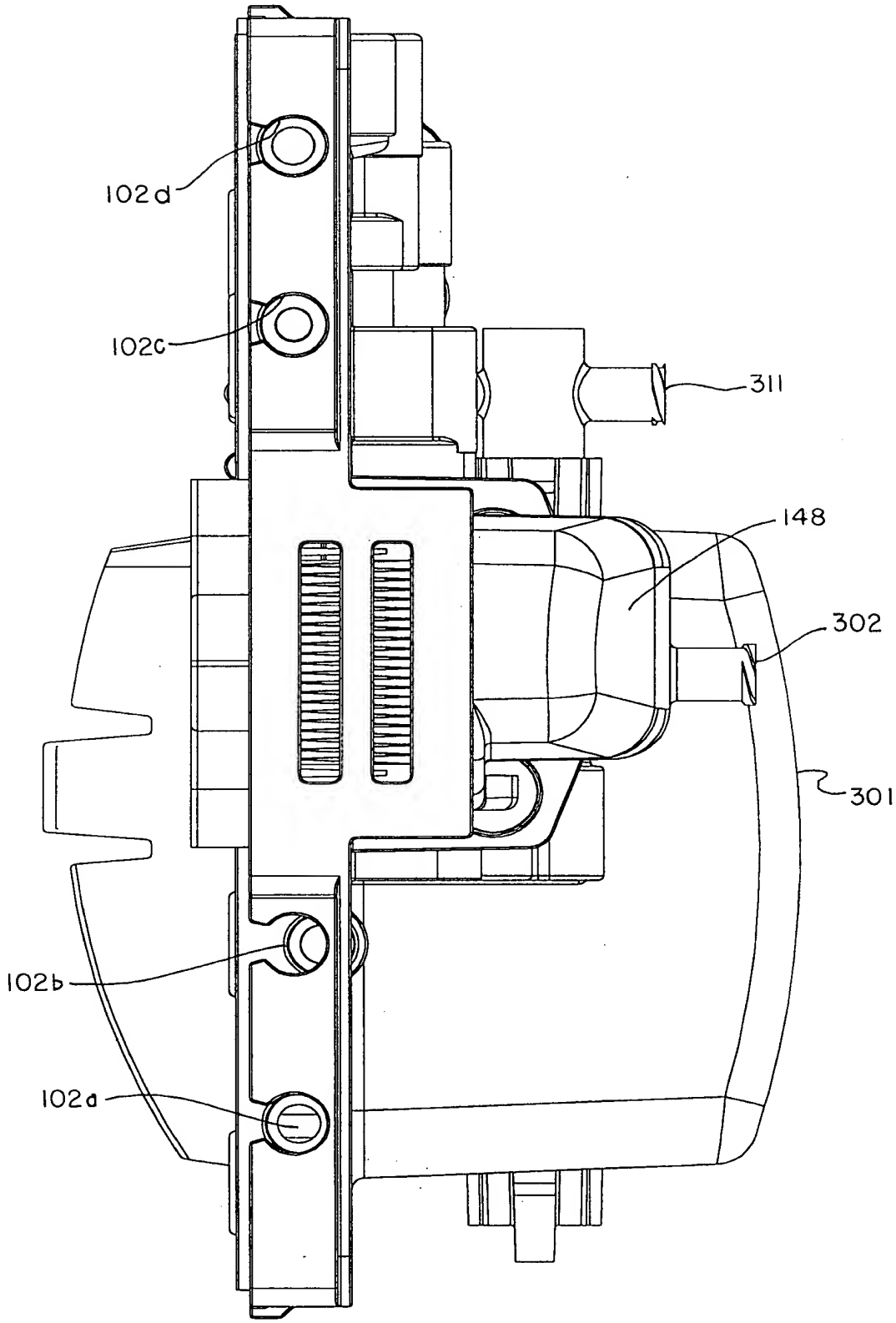
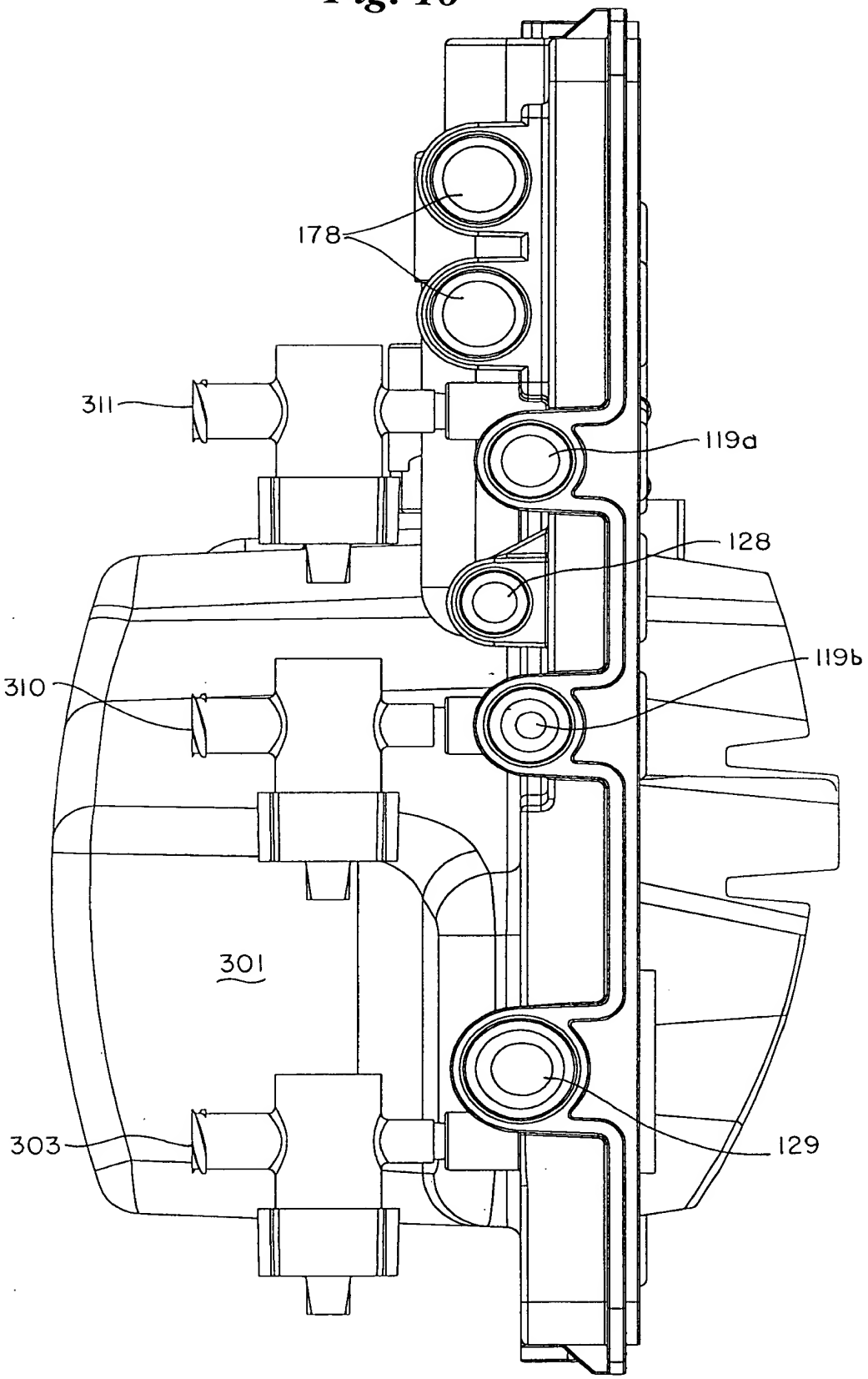


Fig. 17



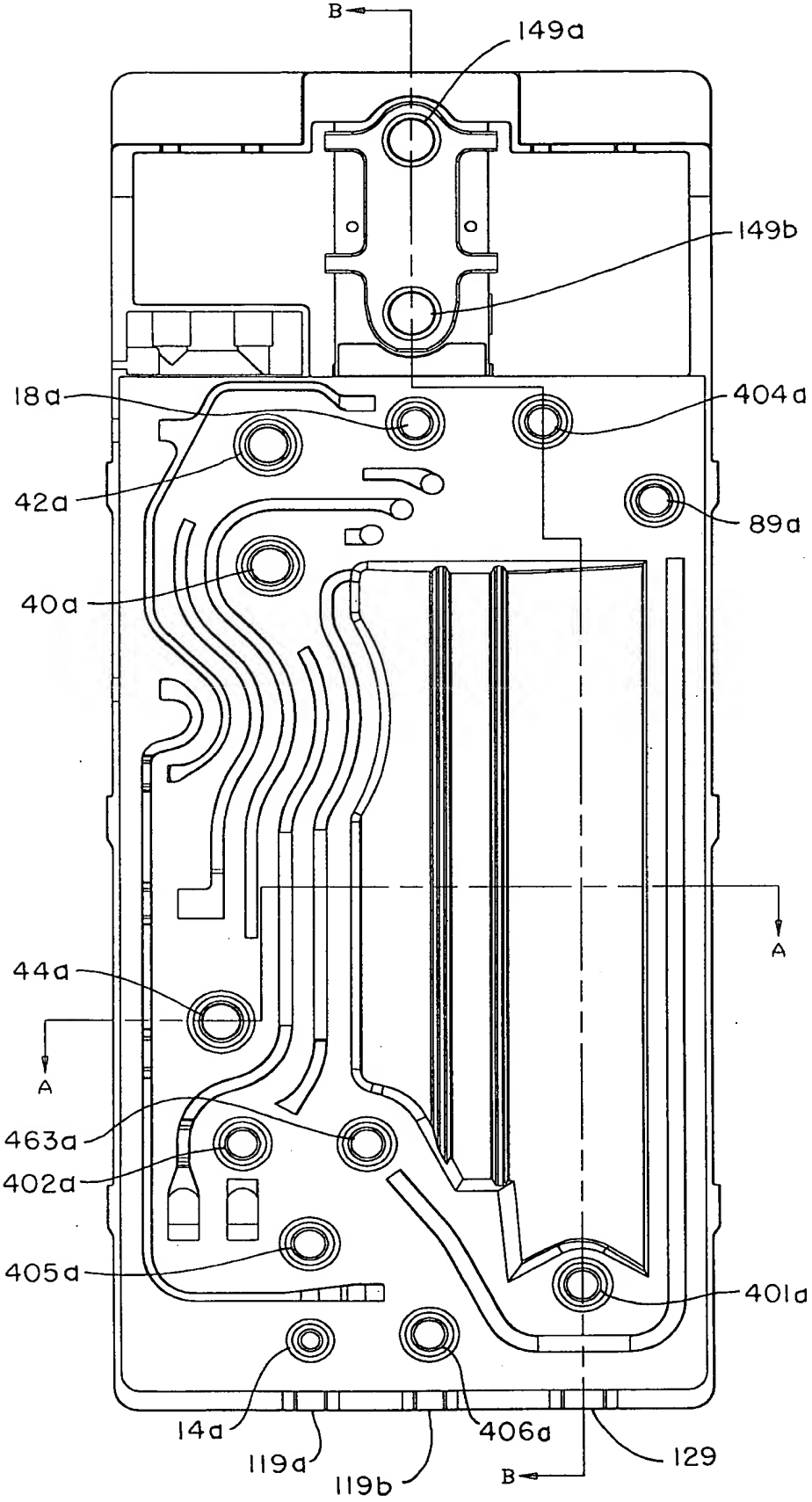
Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 18



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 19A



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 19B

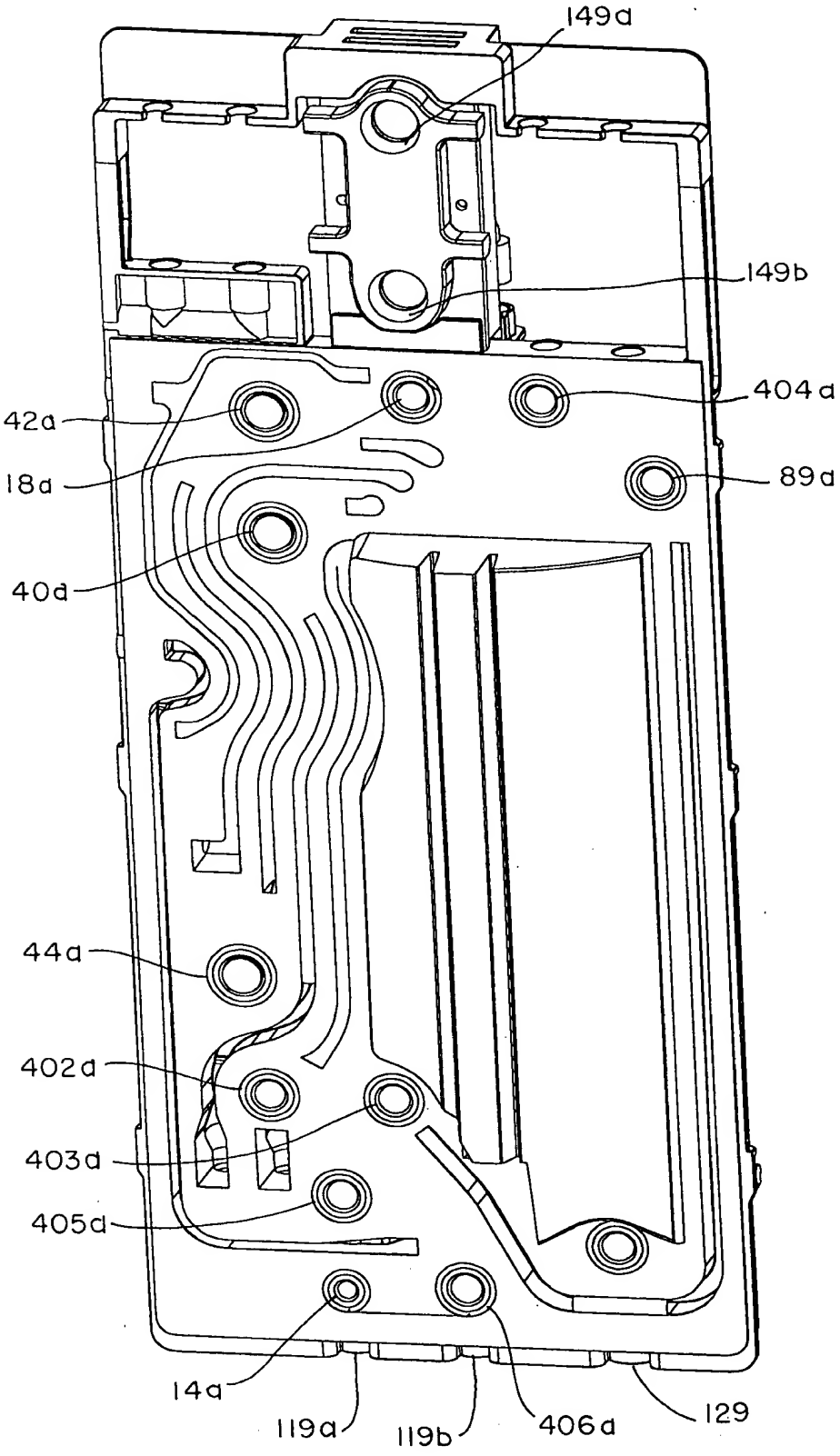


Fig. 20A

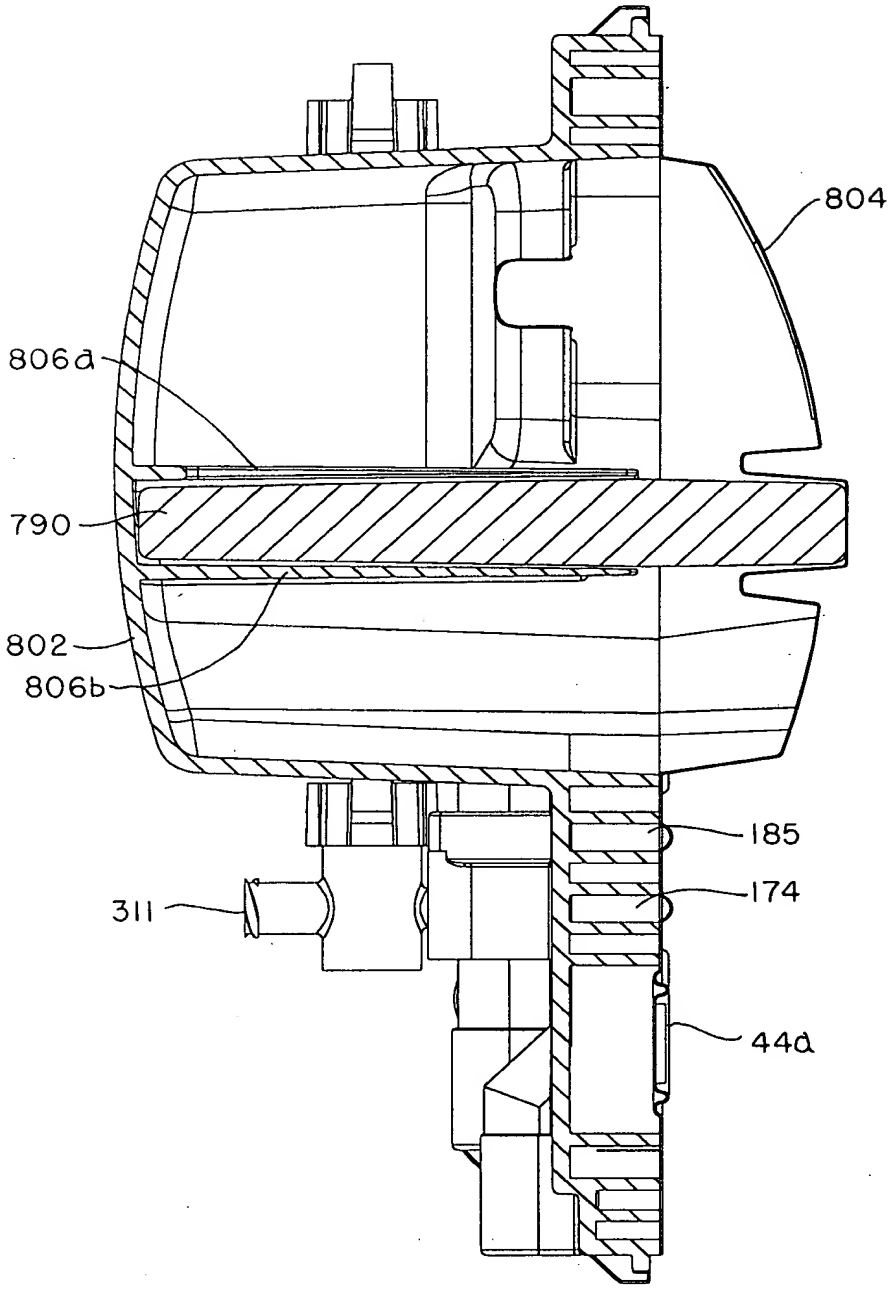


Fig. 20B

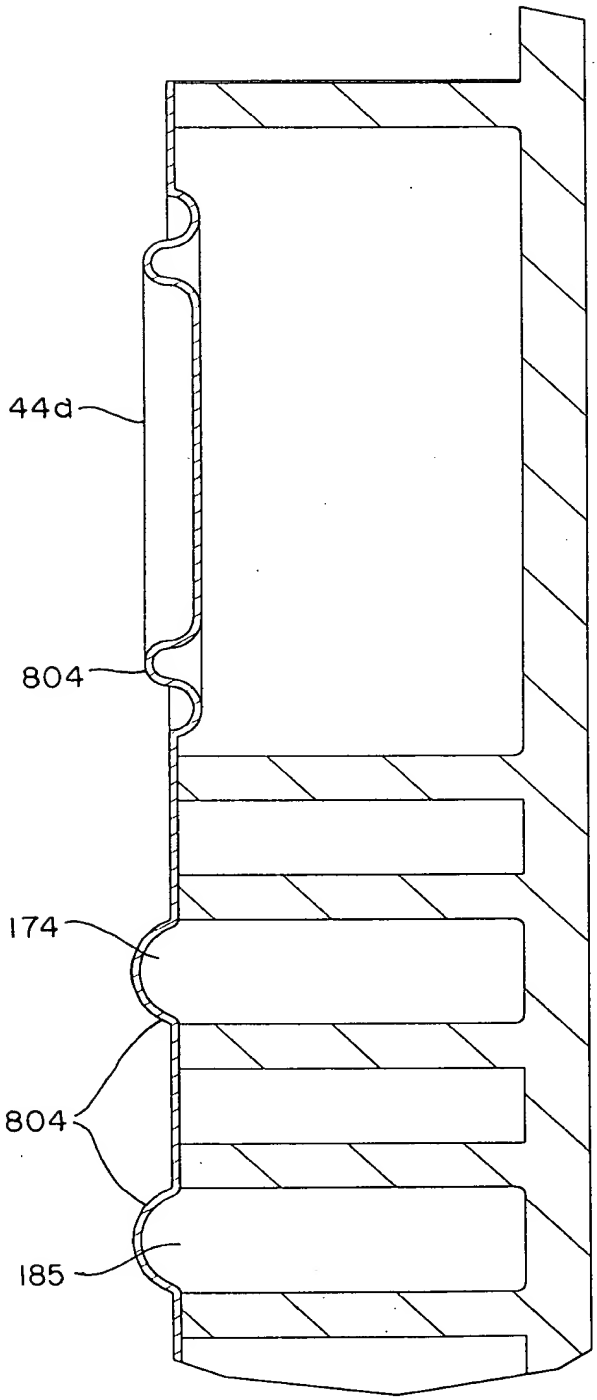
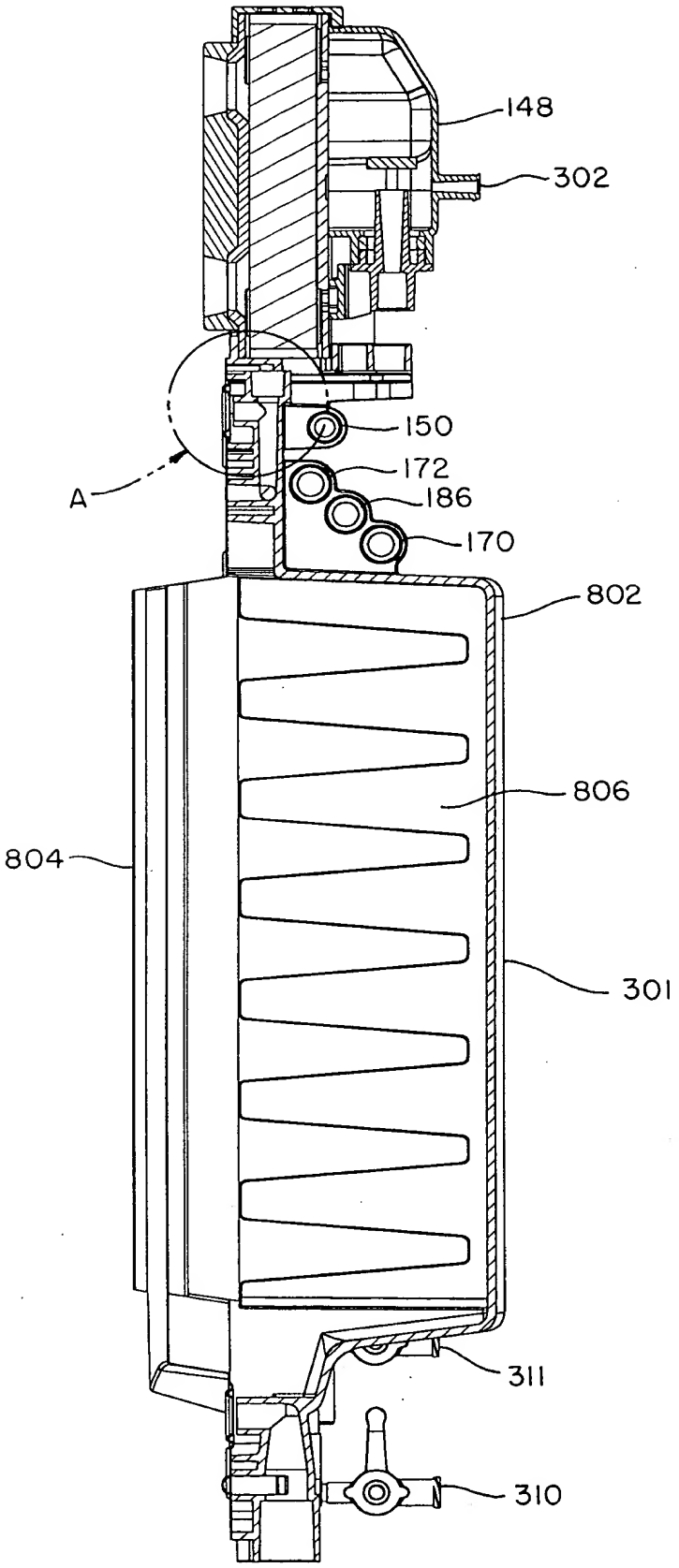


Fig. 21



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 22

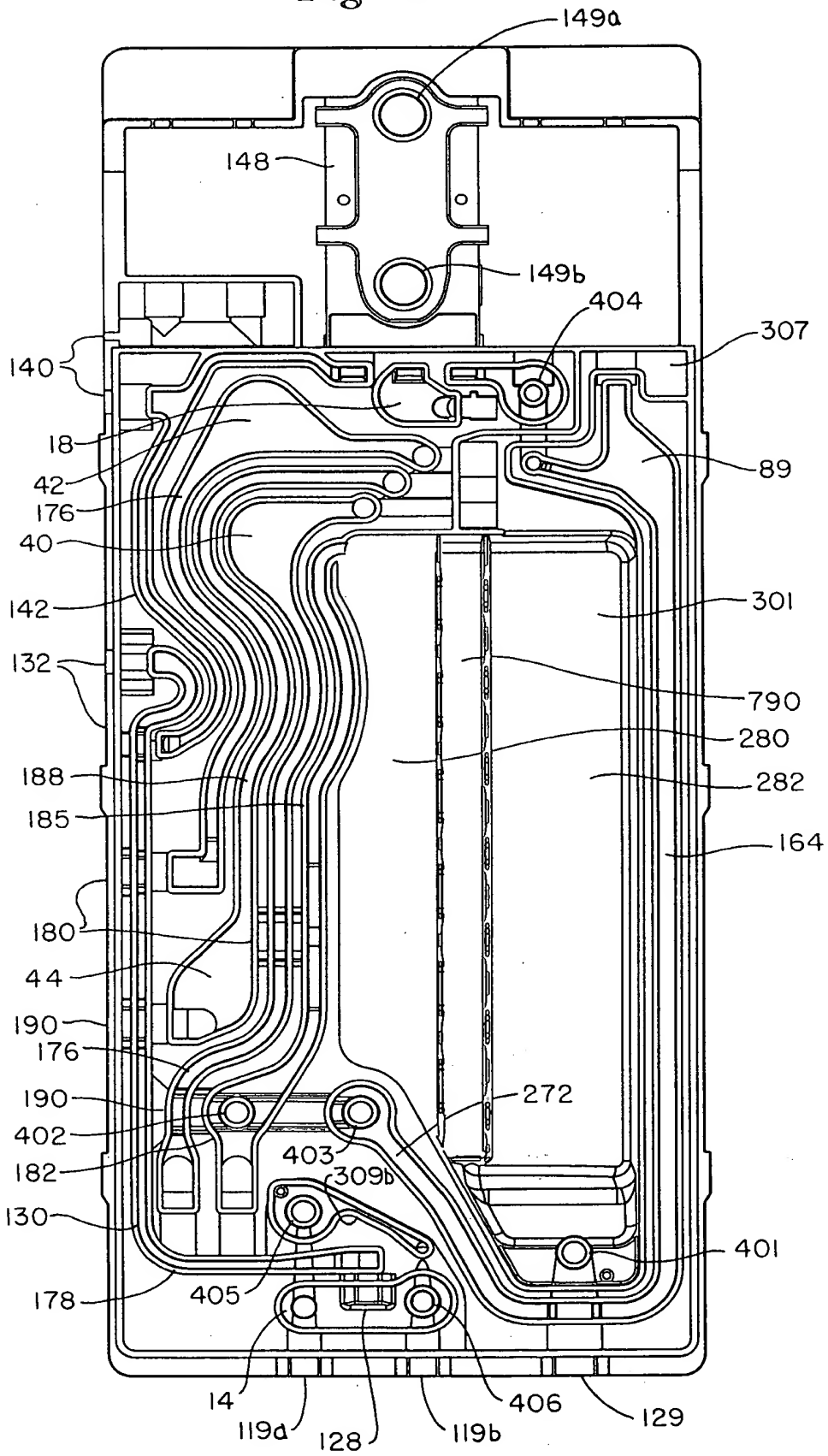


Fig.23A

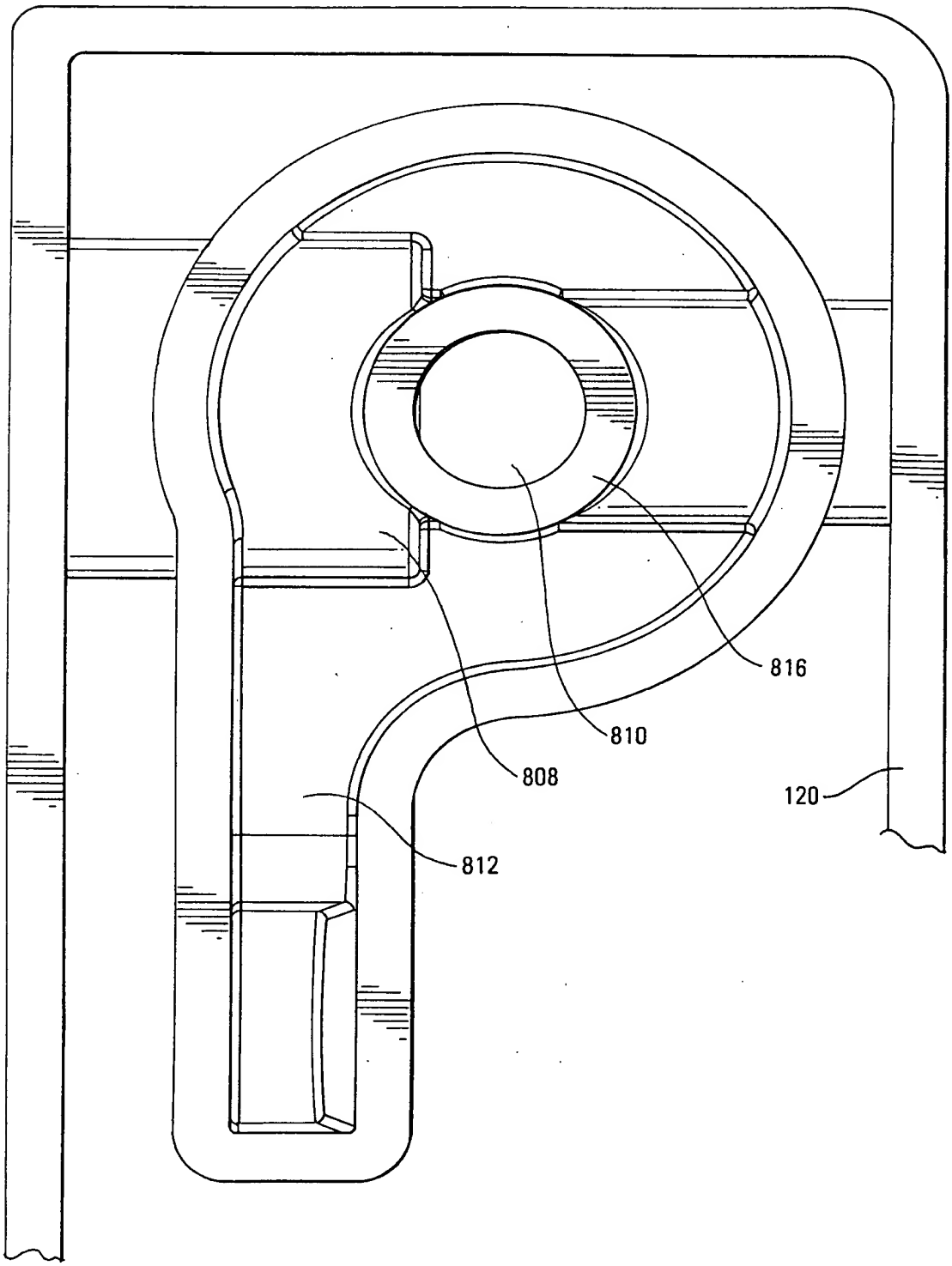


Fig.23B

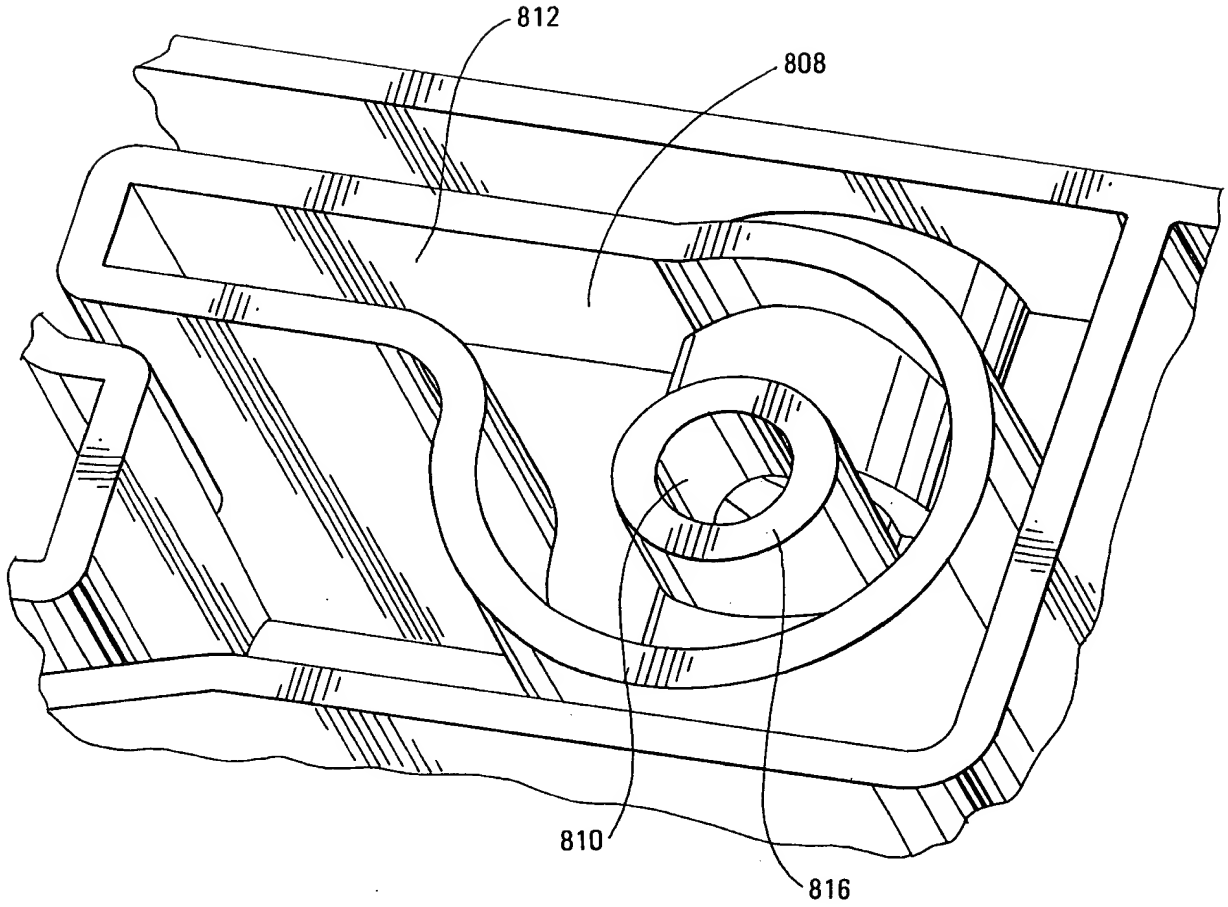
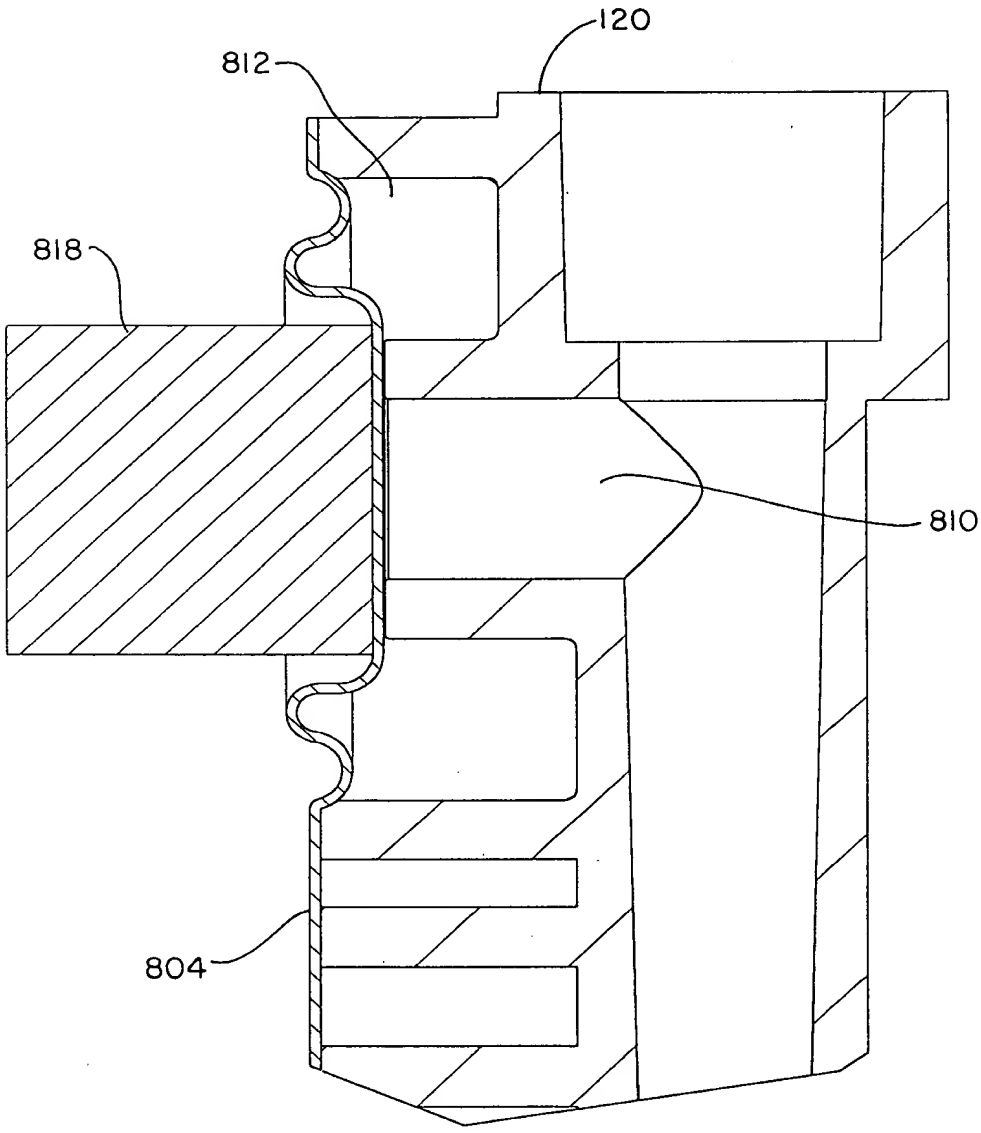


Fig. 24A



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 24B

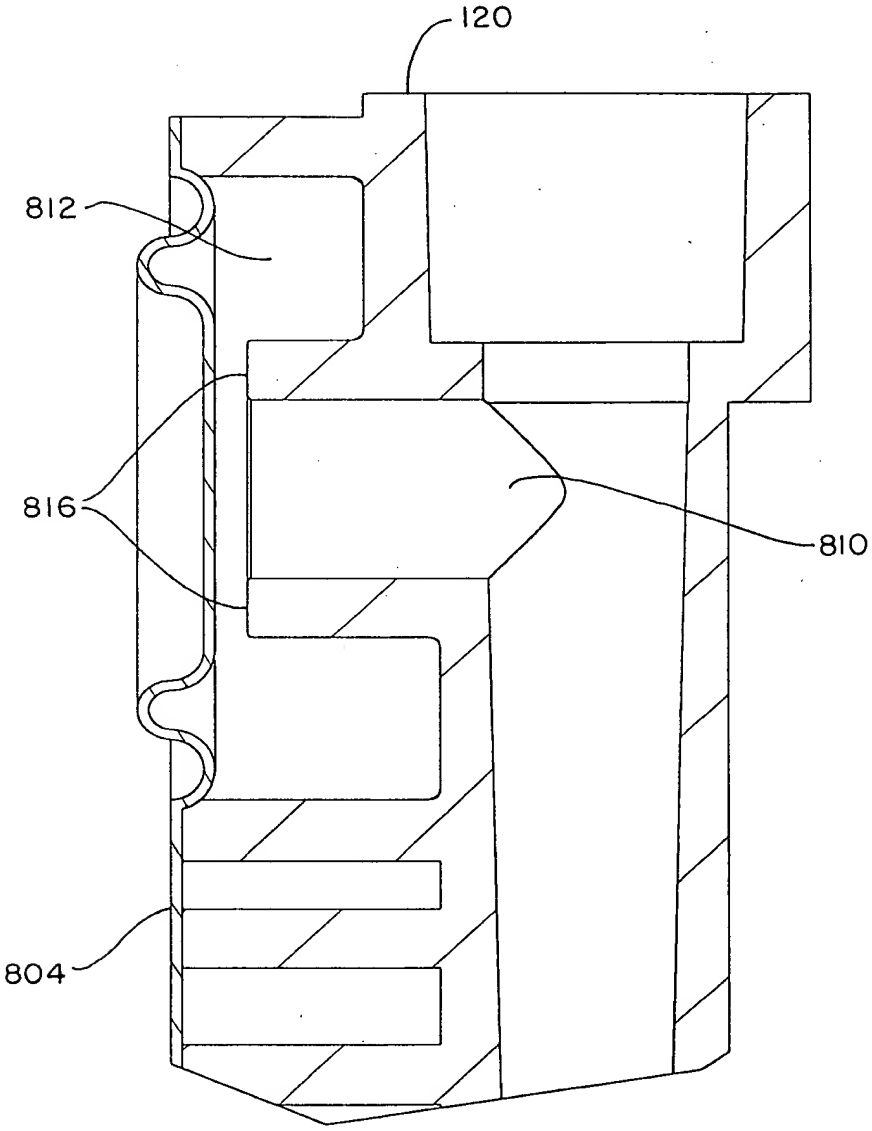
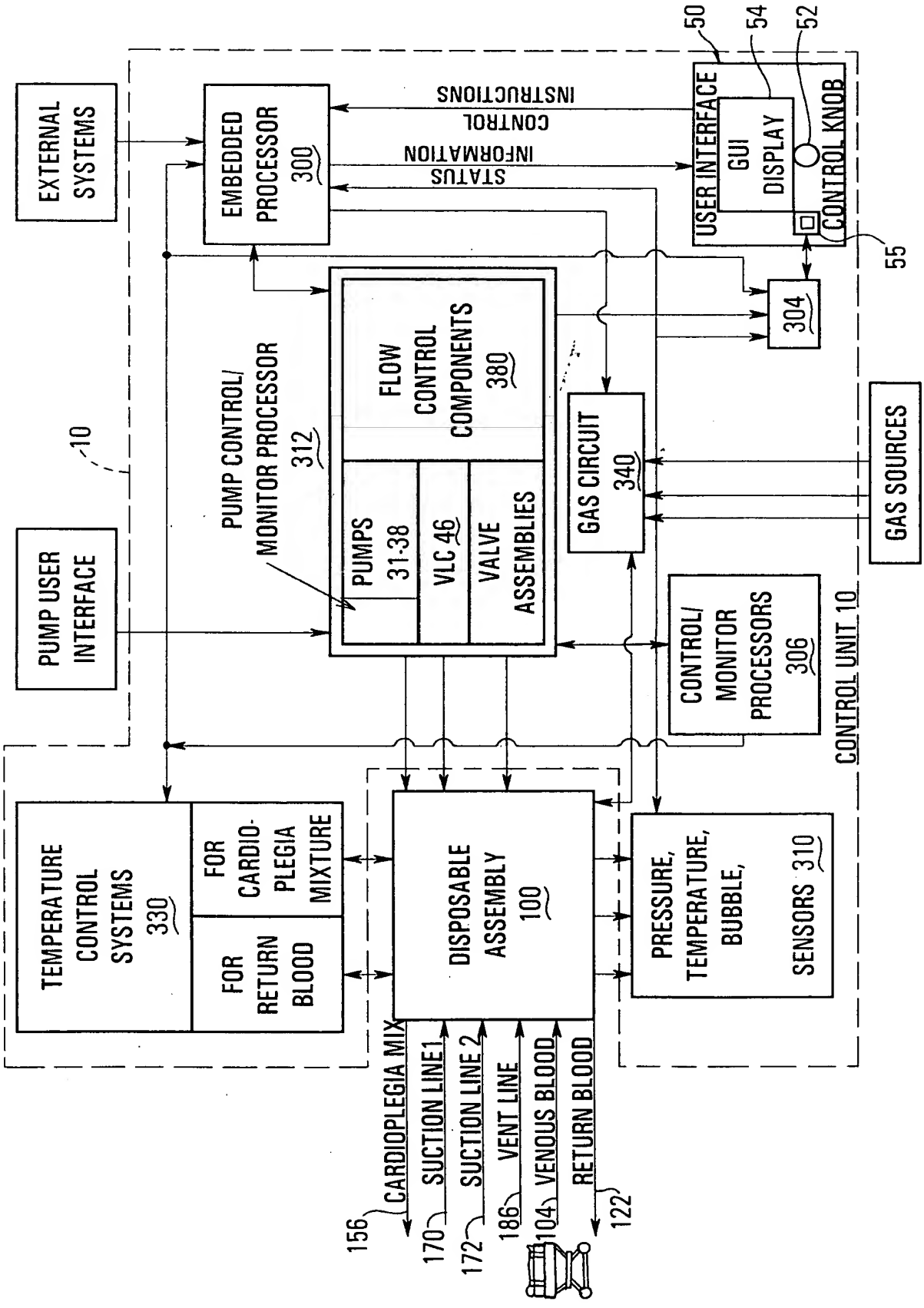


Fig.25


EXTERNAL SYSTEMS
EMBEDDED PROCESSOR 300
INSTRUCTIONS
CONTROL
INFORMATION
STATUS
USER INTERFACE
GUI DISPLAY
CONTROL KNOB
50
54
52
55
304
FLOW CONTROL COMPONENTS 380
PUMP CONTROL/ MONITOR PROCESSOR 312
PUMPS 31-38
VLC 46
VALVE ASSEMBLIES
GAS CIRCUIT 340
GAS SOURCES
10
PUMP USER INTERFACE
CONTROL/ MONITOR PROCESSORS 306
CONTROL UNIT 10
TEMPERATURE CONTROL SYSTEMS 330
FOR CARDIO-PLEGIA MIXTURE
FOR RETURN BLOOD
DISPOSABLE ASSEMBLY 100
PRESSURE, TEMPERATURE, BUBBLE, SENSORS 310
CARDIOPLEGIA MIX
SUCTION LINE1
SUCTION LINE 2
VENT LINE
VENOUS BLOOD
RETURN BLOOD
156
170
172
186
104
122

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

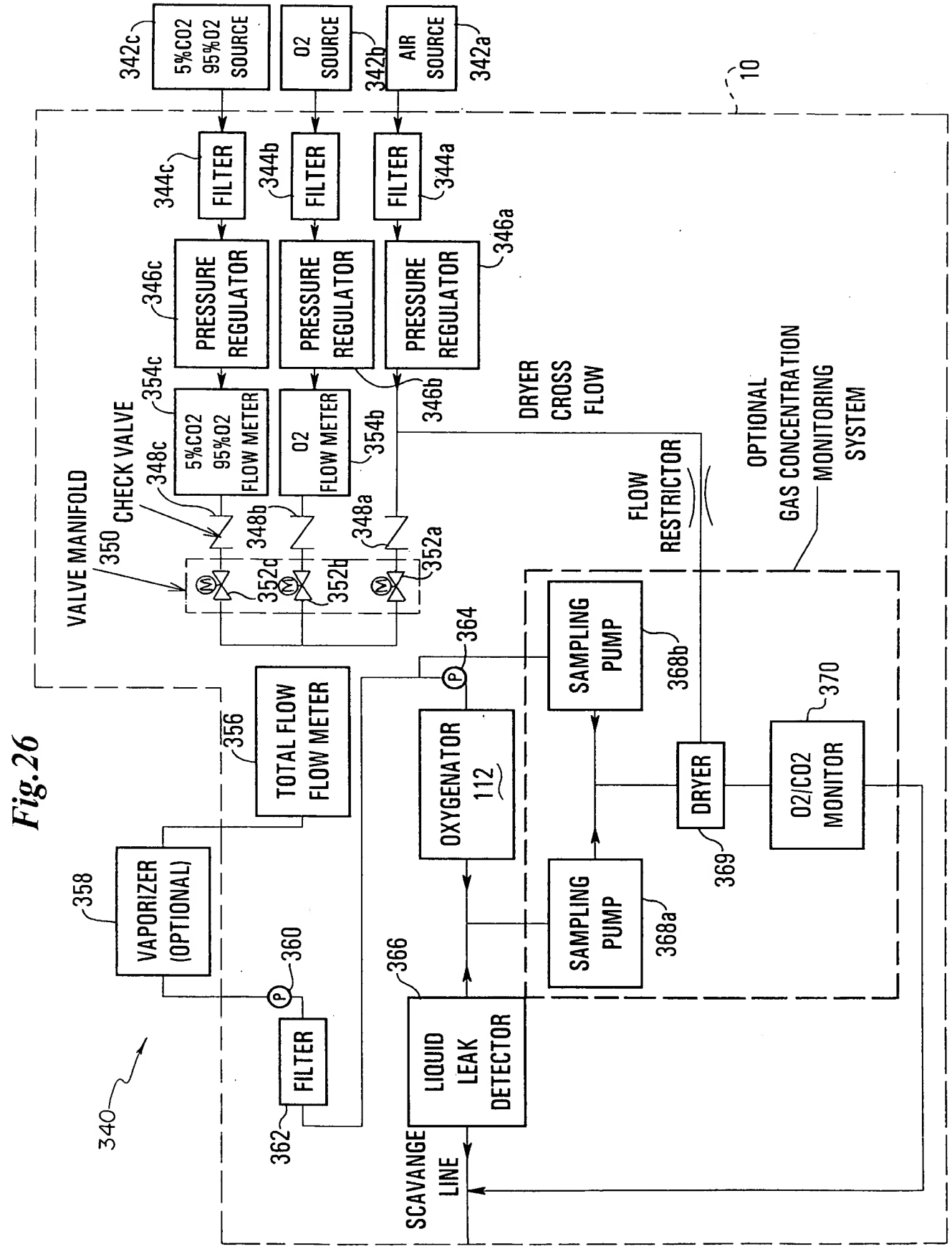
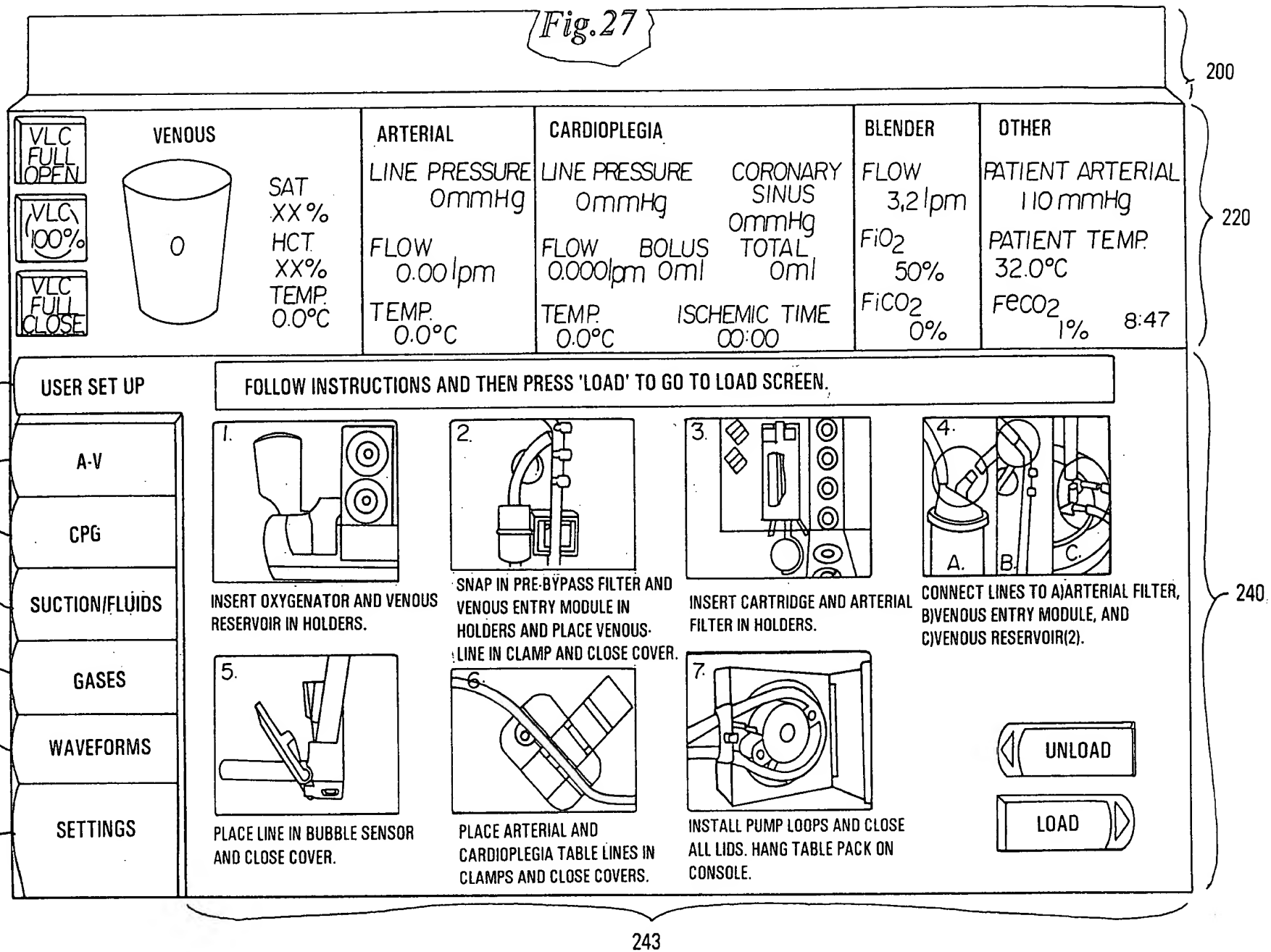


Fig. 26

Fig.27



SHEET 48/76
Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

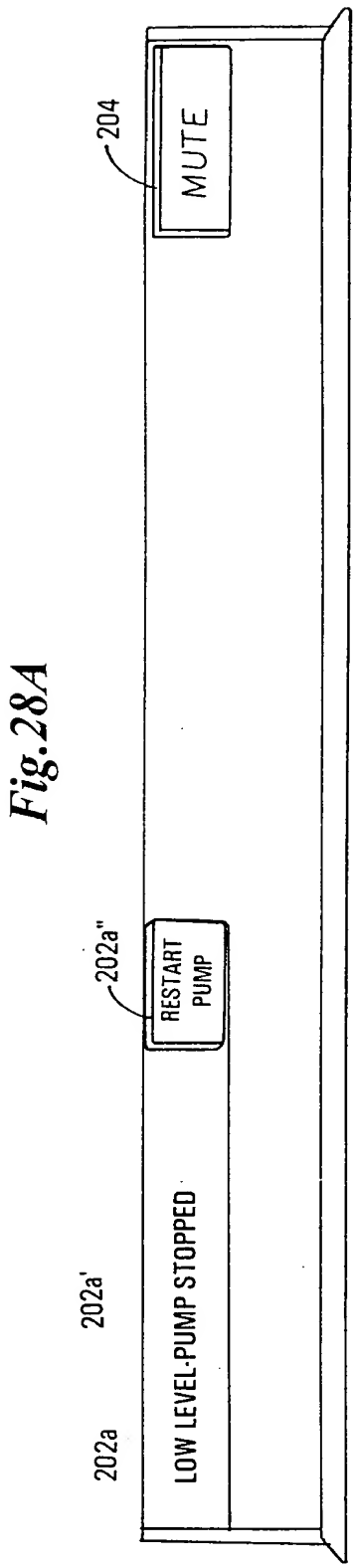


Fig.28A

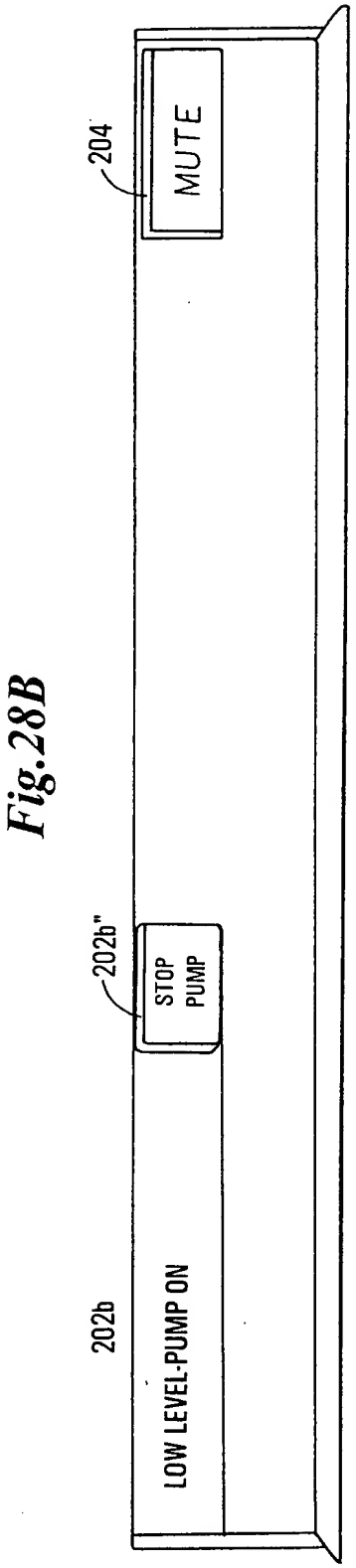


Fig.28B

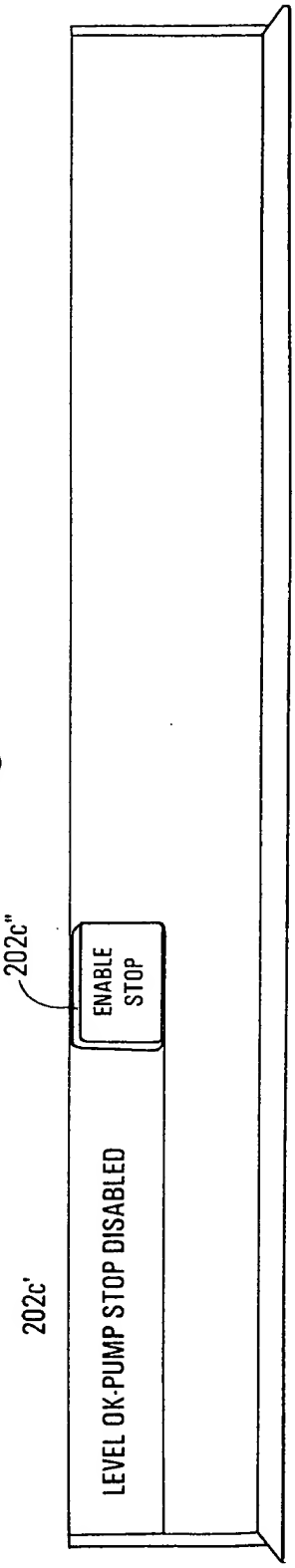


Fig.28C

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

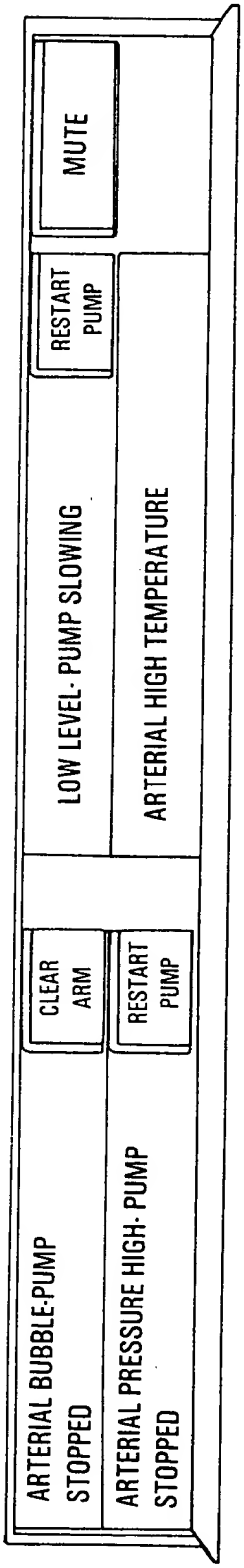


Fig.28D

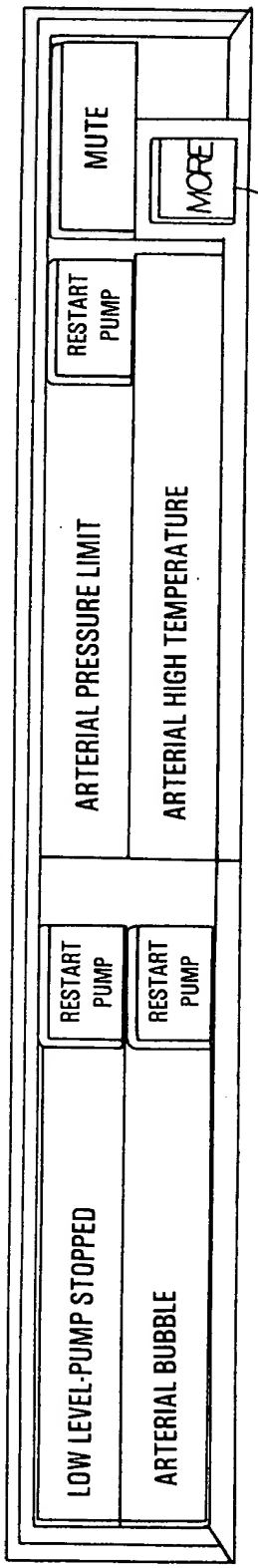


Fig.28E

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

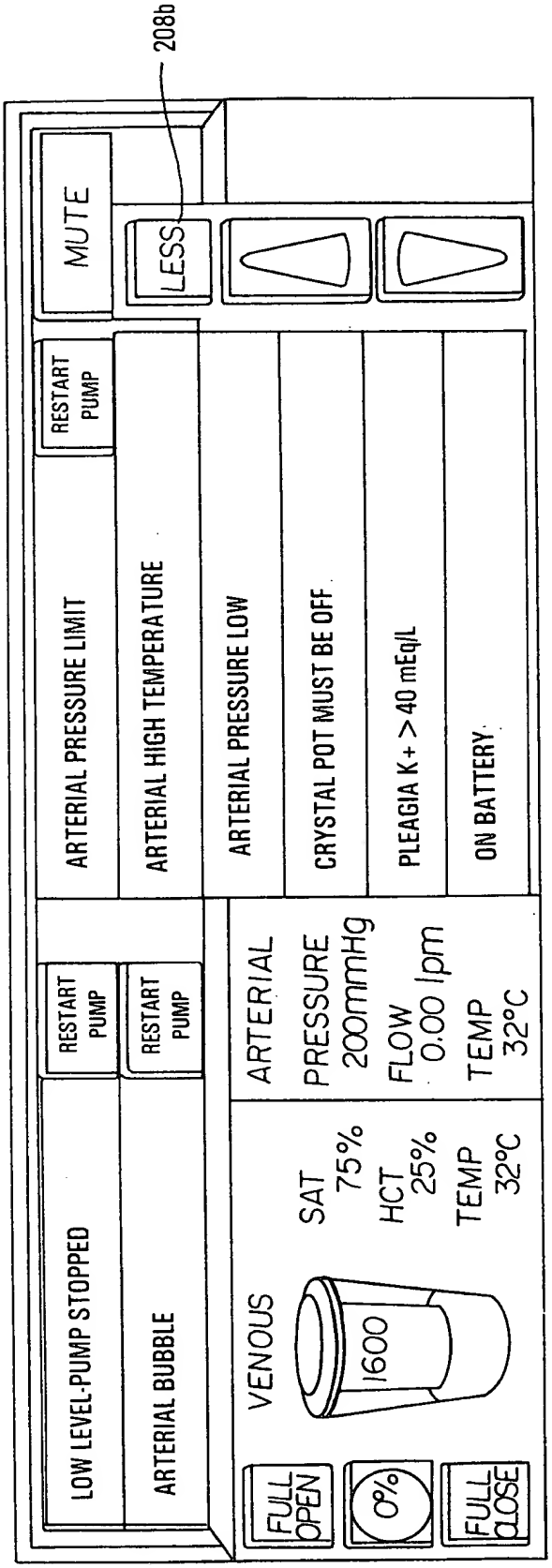
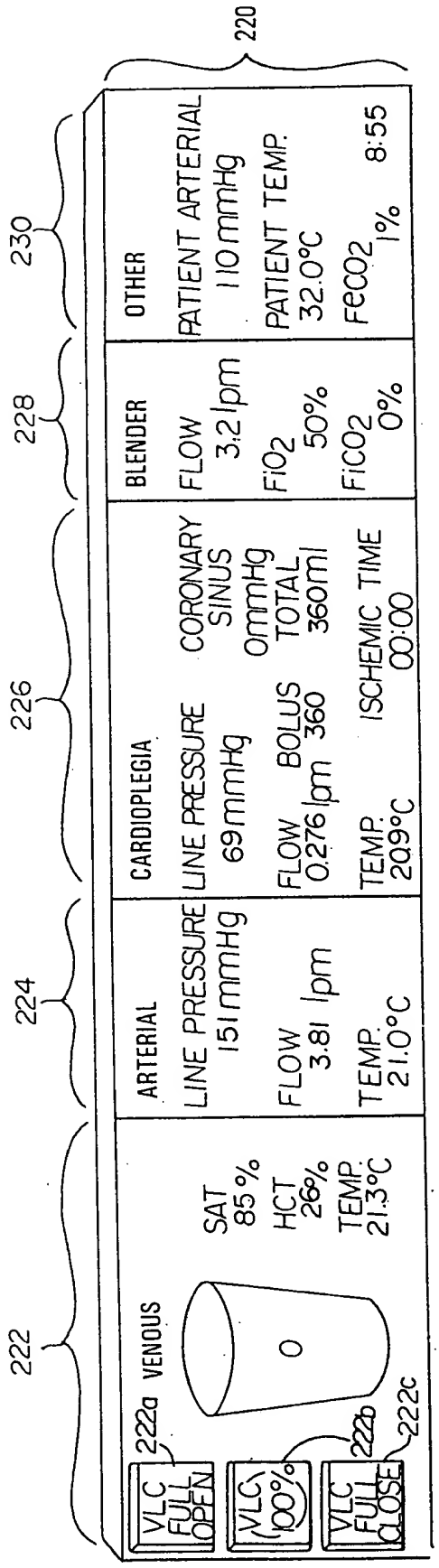


Fig. 28F

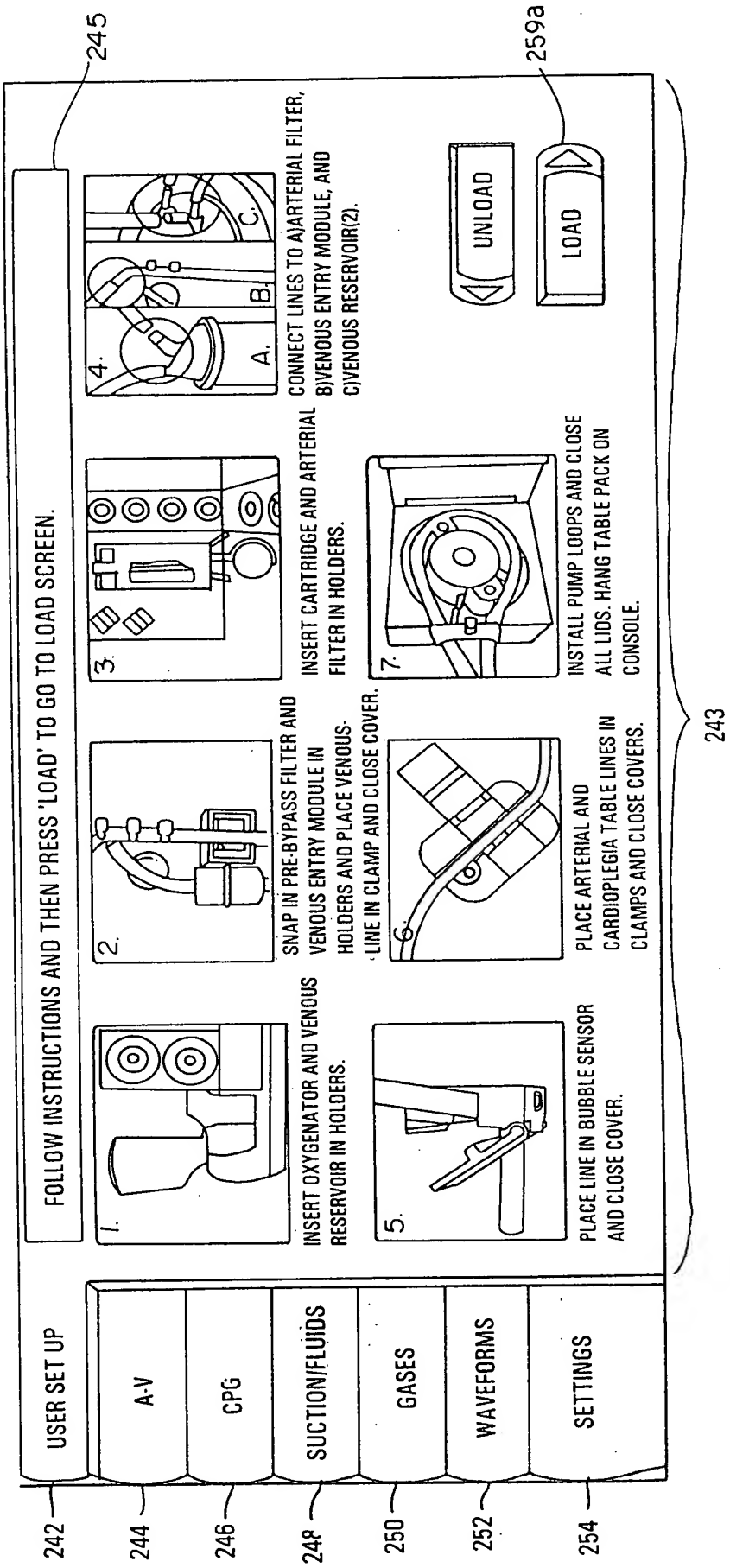
Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 29



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig. 30A



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

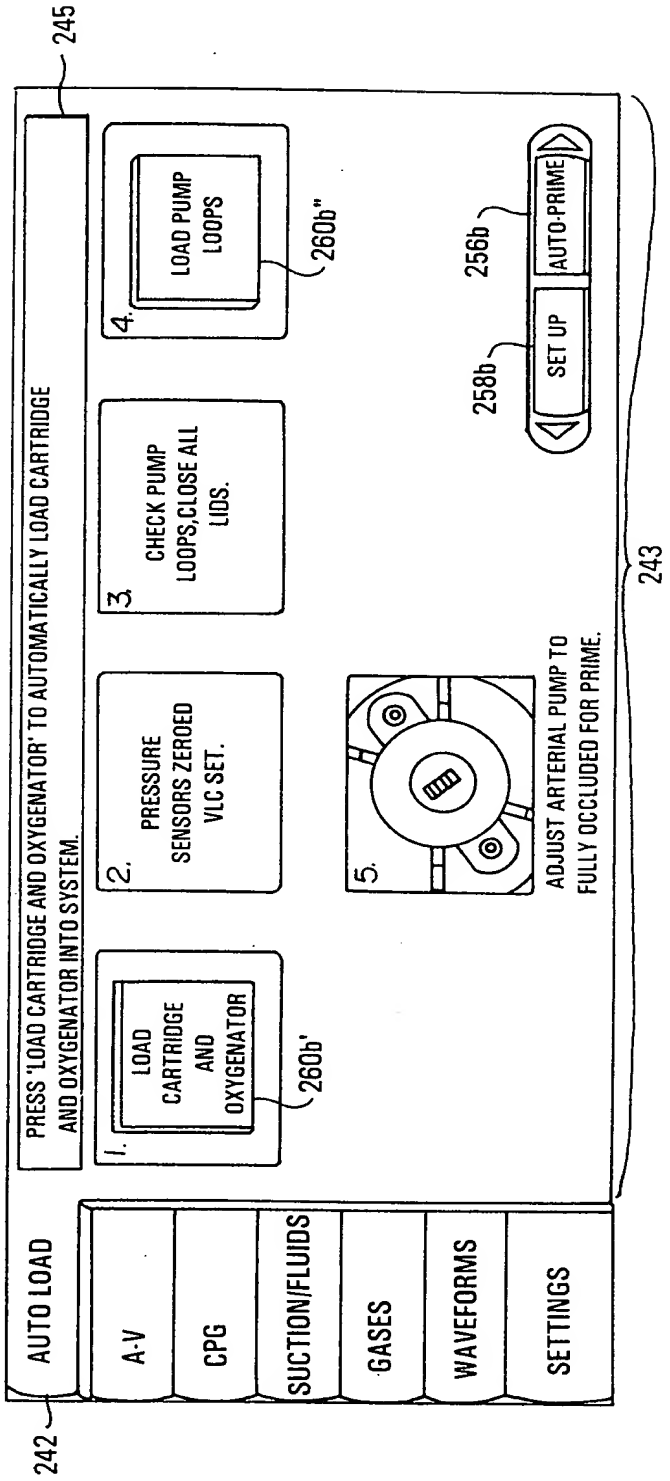


Fig.30B

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

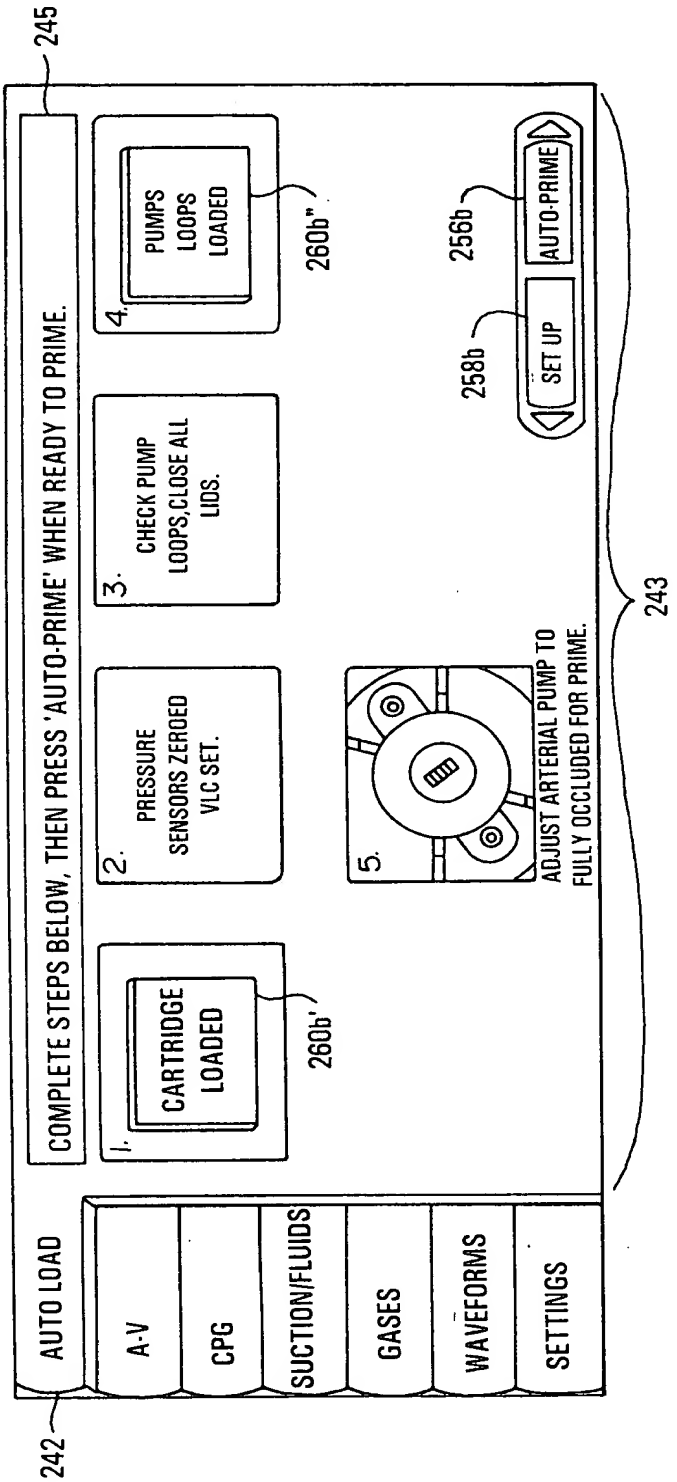


Fig. 30C

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

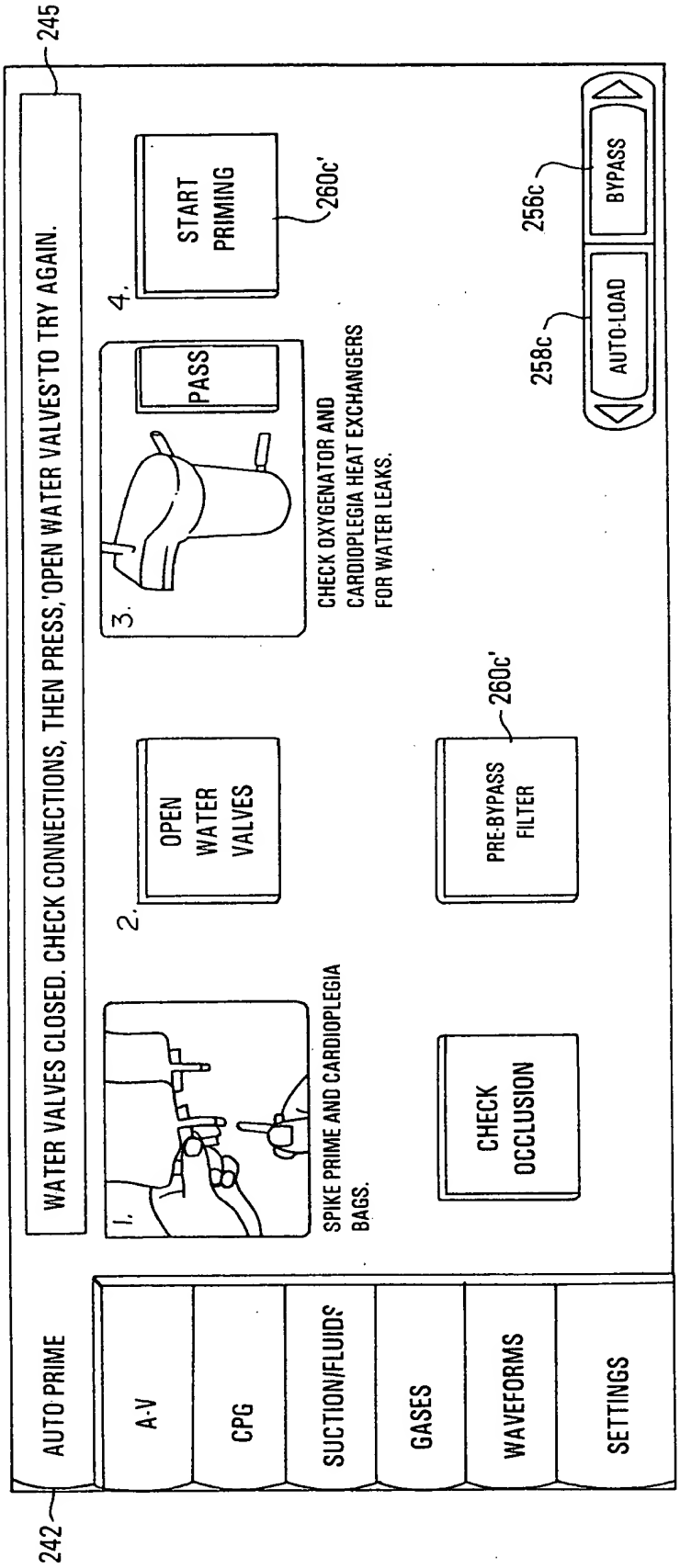


Fig.30D

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

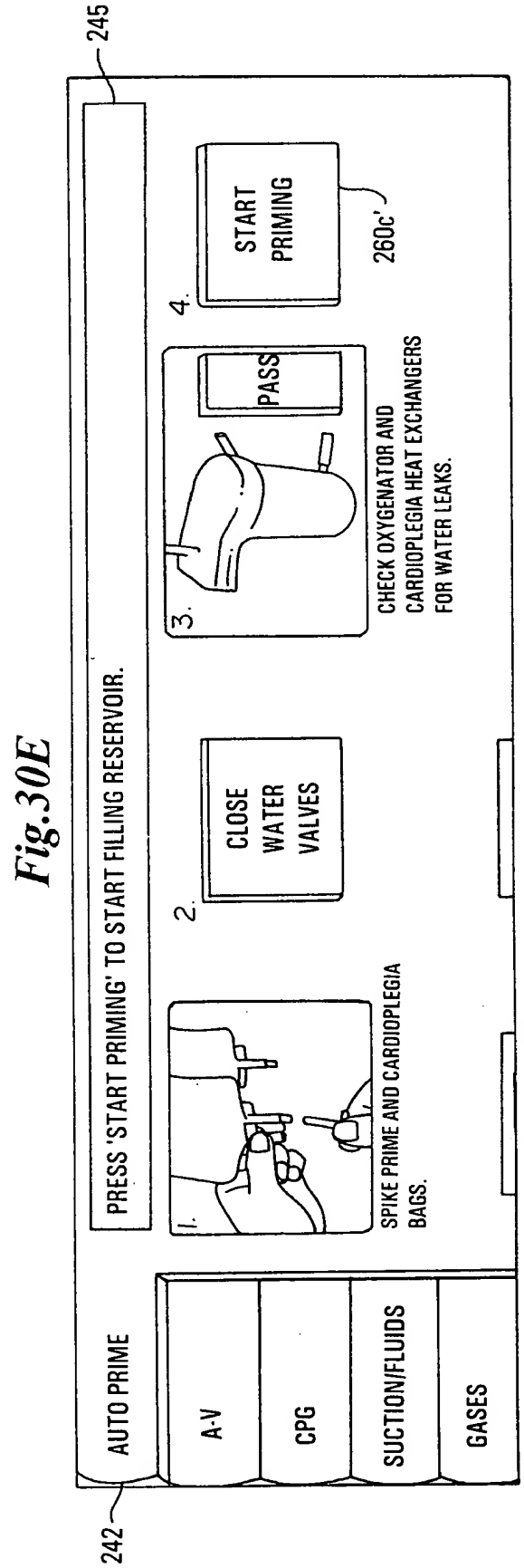


Fig.30E

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

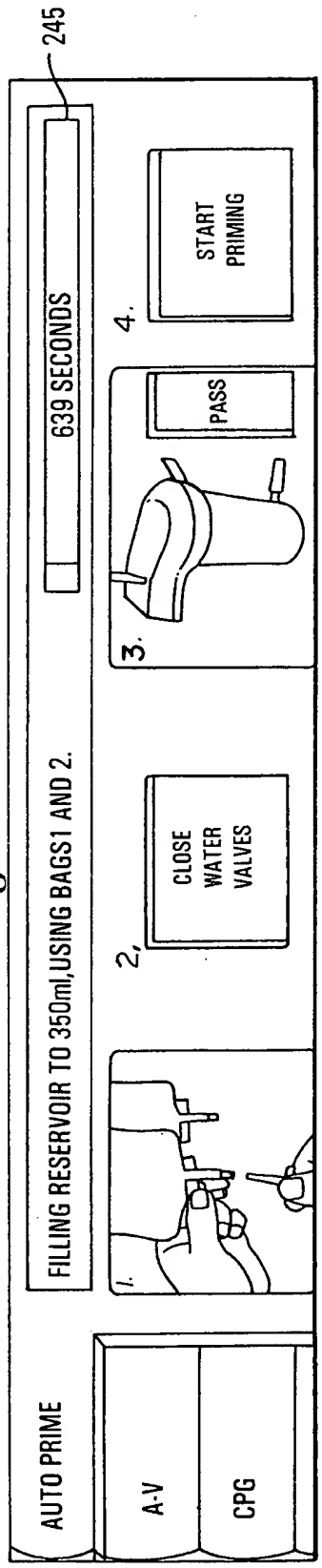
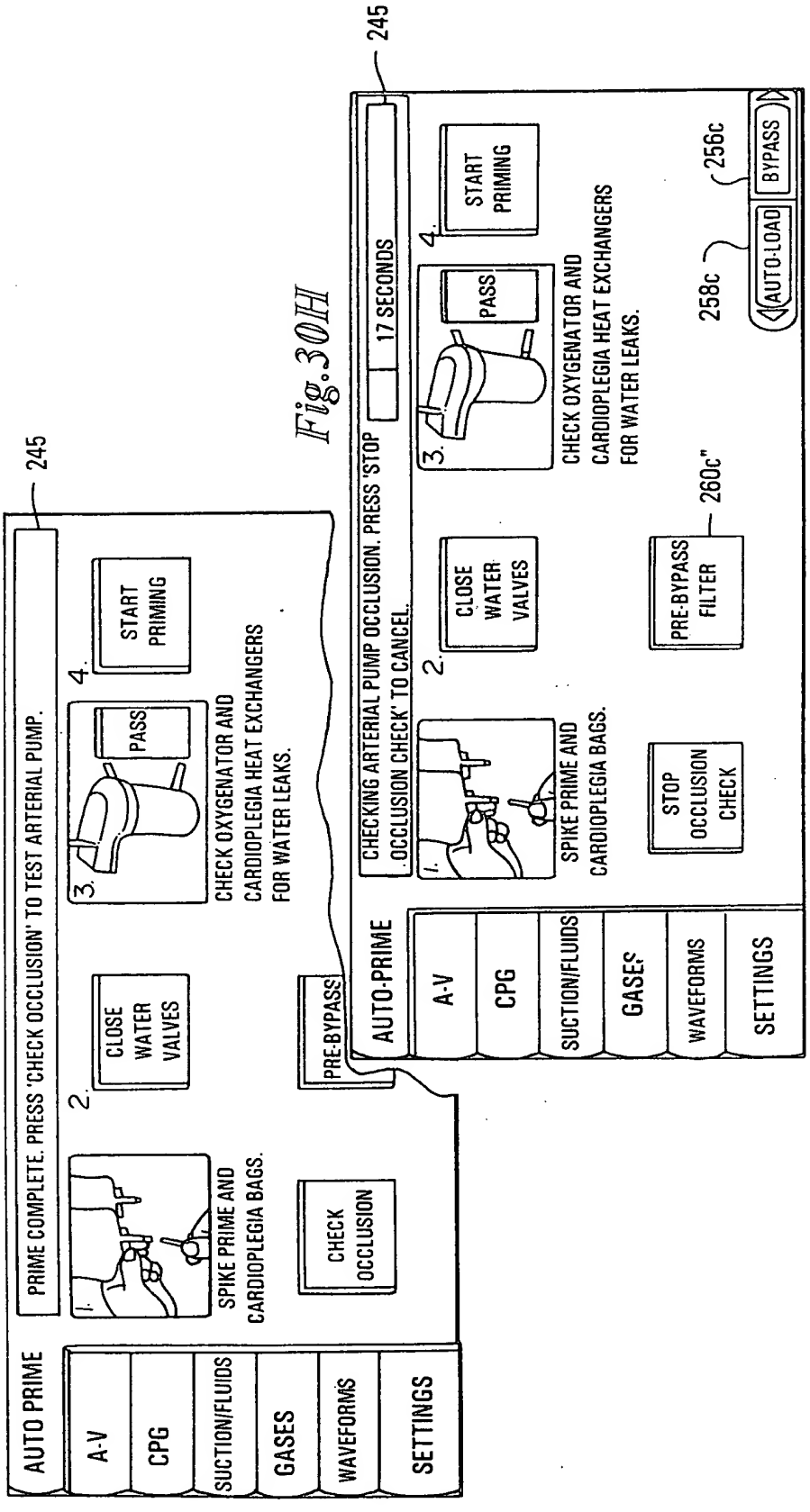


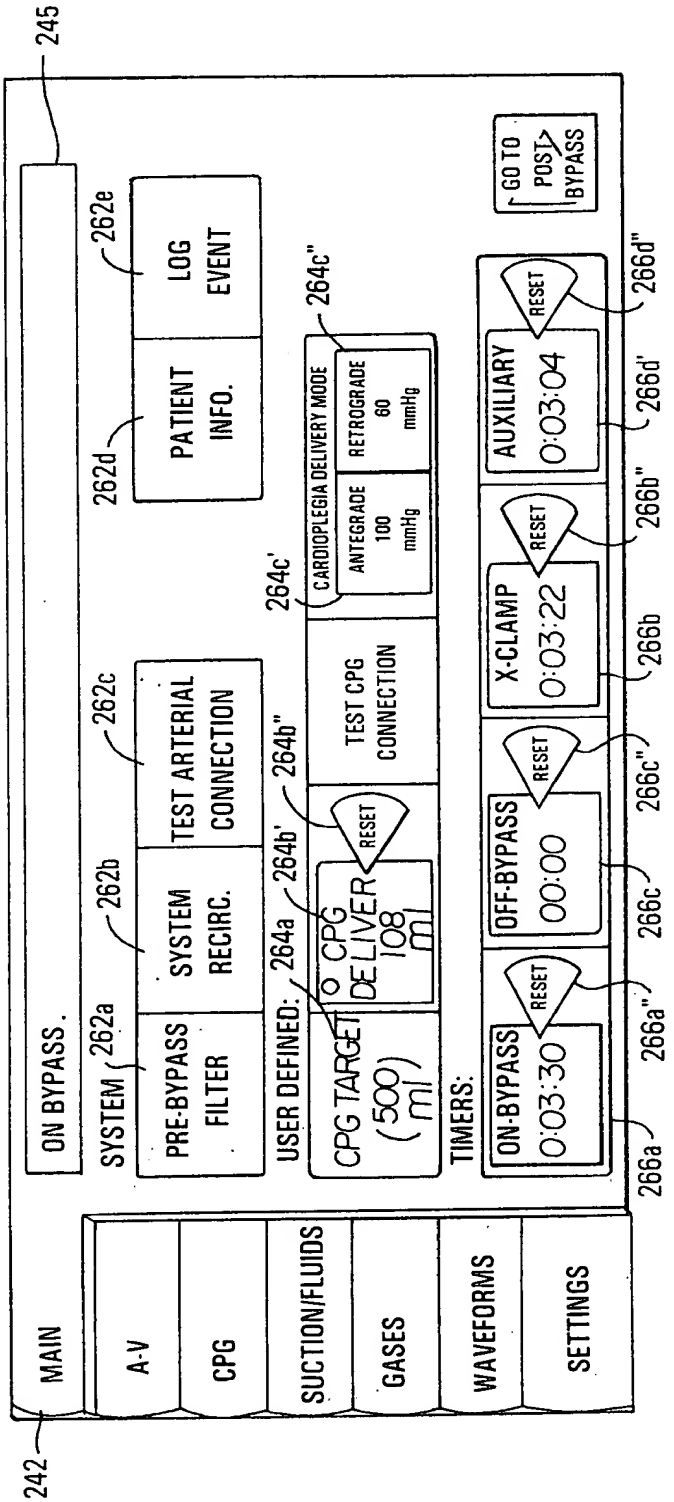
Fig.30F

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992



Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig.30I



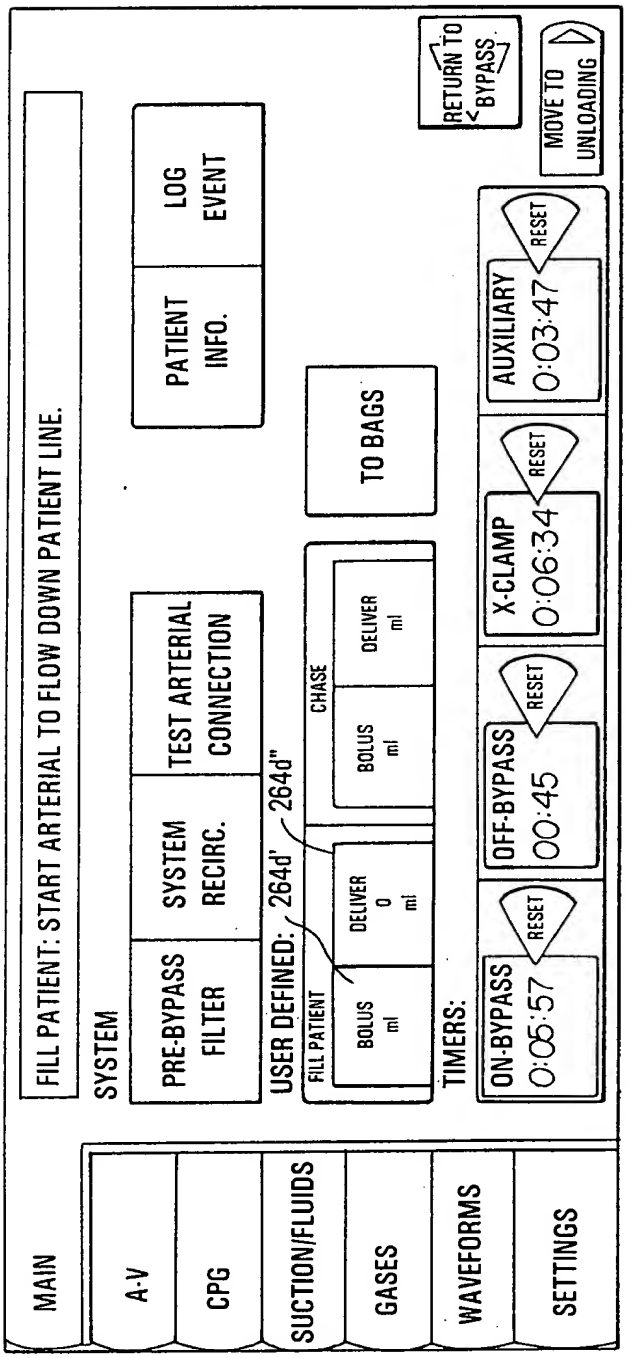

MAIN
A-V
CPG
SUCTION/FLUIDS
GASES
WAVEFORMS
SETTINGS
FILL PATIENT: START ARTERIAL TO FLOW DOWN PATIENT LINE.
SYSTEM
PRE-BYPASS FILTER
SYSTEM RECIRC.
TEST ARTERIAL CONNECTION
PATIENT INFO.
LOG EVENT
USER DEFINED:
264d'
264d"
FILL PATIENT
BOLUS ml
DELIVER 0 ml
CHASE
BOLUS ml
DELIVER ml
TO BAGS
RETURN TO BYPASS
MOVE TO UNLOADING
TIMERS:
ON-BYPASS
0:05:57
RESET
OFF-BYPASS
00:45
RESET
X-CLAMP
0:06:34
RESET
AUXILIARY
0:03:47
RESET

Fig.30J

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

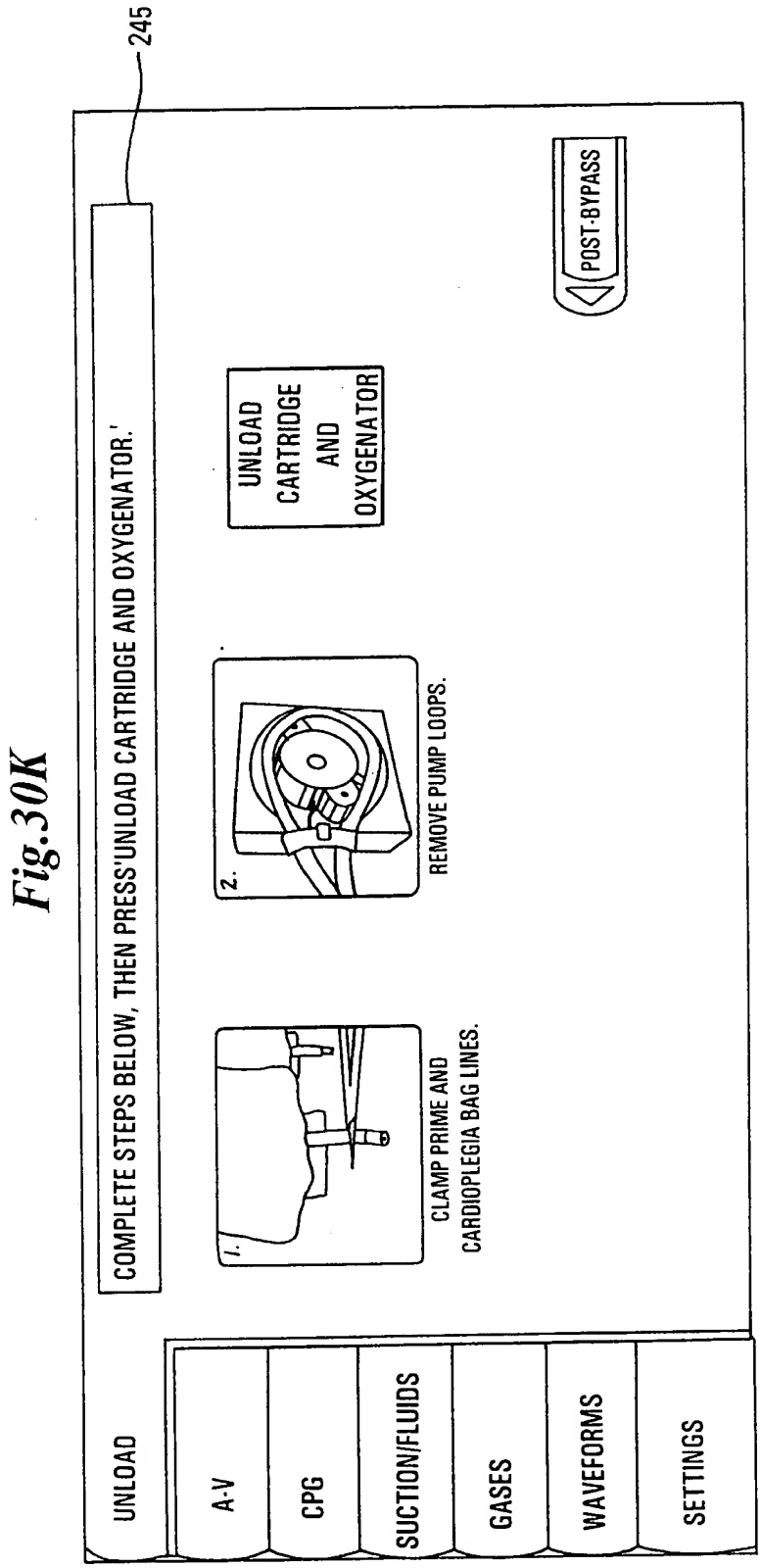


Fig.30K

Serial No. 09/963,793
Applicant: Kevin Kollar et a[redacted]
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

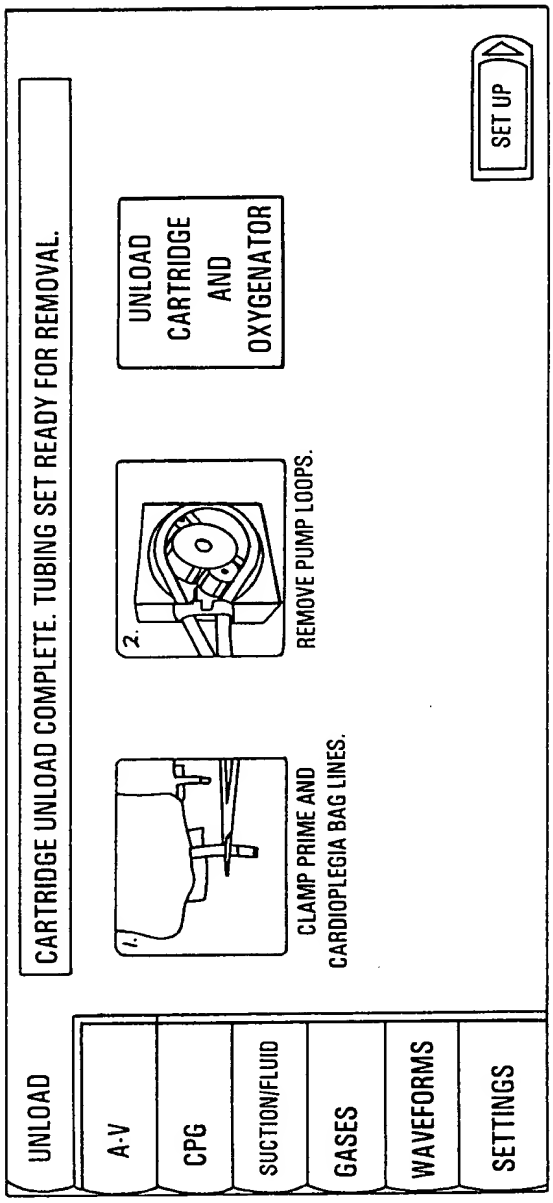
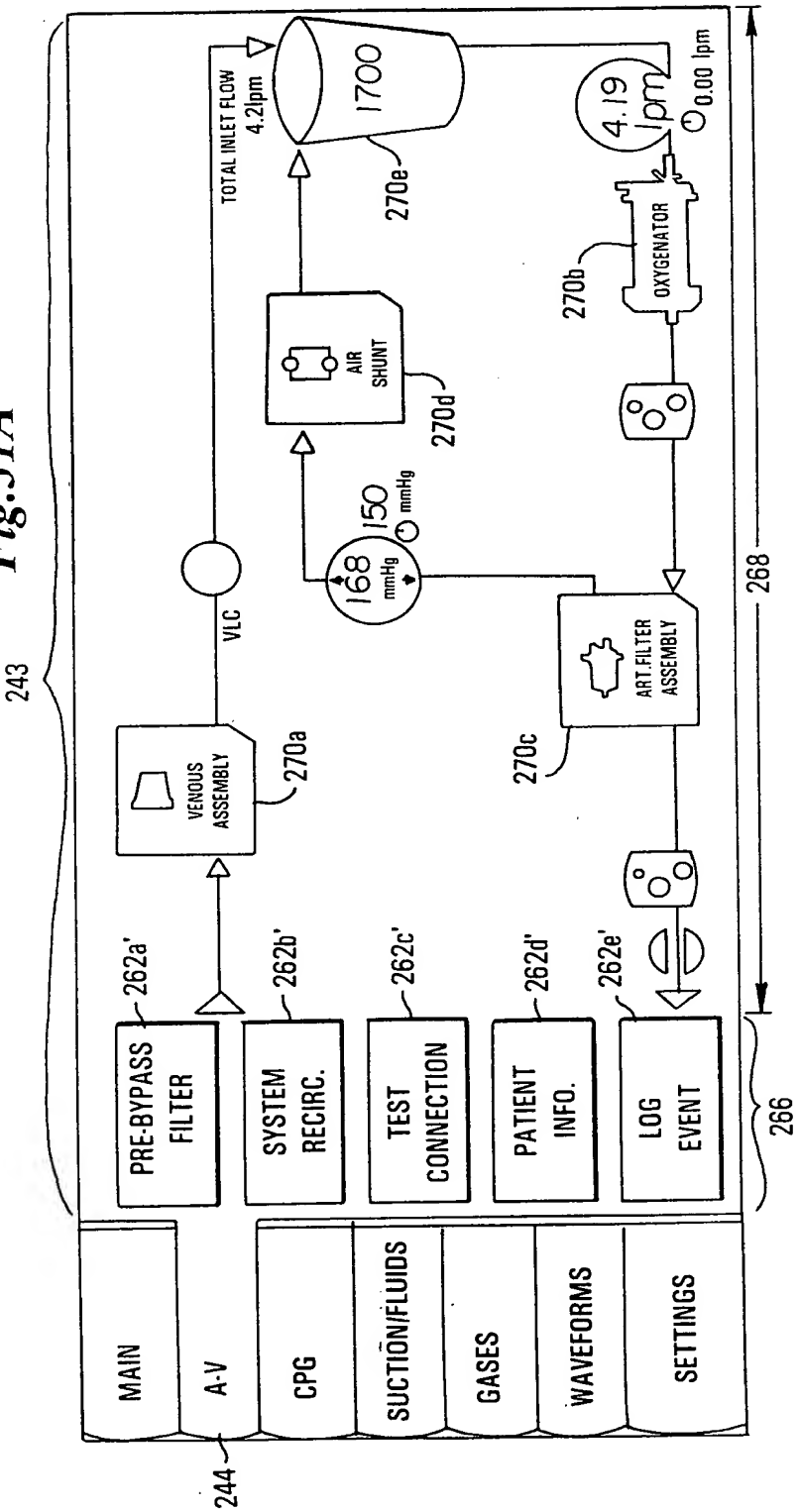


Fig.30L

Fig.31A


243
TOTAL INLET FLOW
4.2lpm
1700
270e
4.19
lpm
0.00 lpm
OXYGENATOR
270b
AIR
SHUNT
270d
150
mmHg
168
mmHg
VLC
VENOUS
ASSEMBLY
270a
ART.FILTER
ASSEMBLY
270c
268
262a'
PRE-BYPASS
FILTER
262b'
SYSTEM
RECIRC.
262c'
TEST
CONNECTION
262d'
PATIENT
INFO.
262e'
LOG
EVENT
266
MAIN
A-V
CPG
SUCTION/FLUIDS
GASES
WAVEFORMS
SETTINGS
244

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig.31B

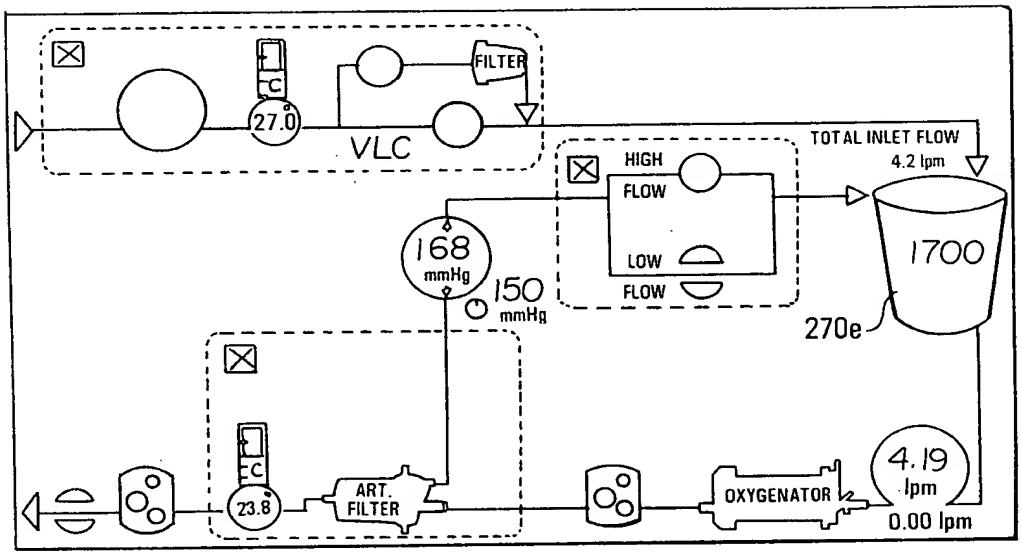
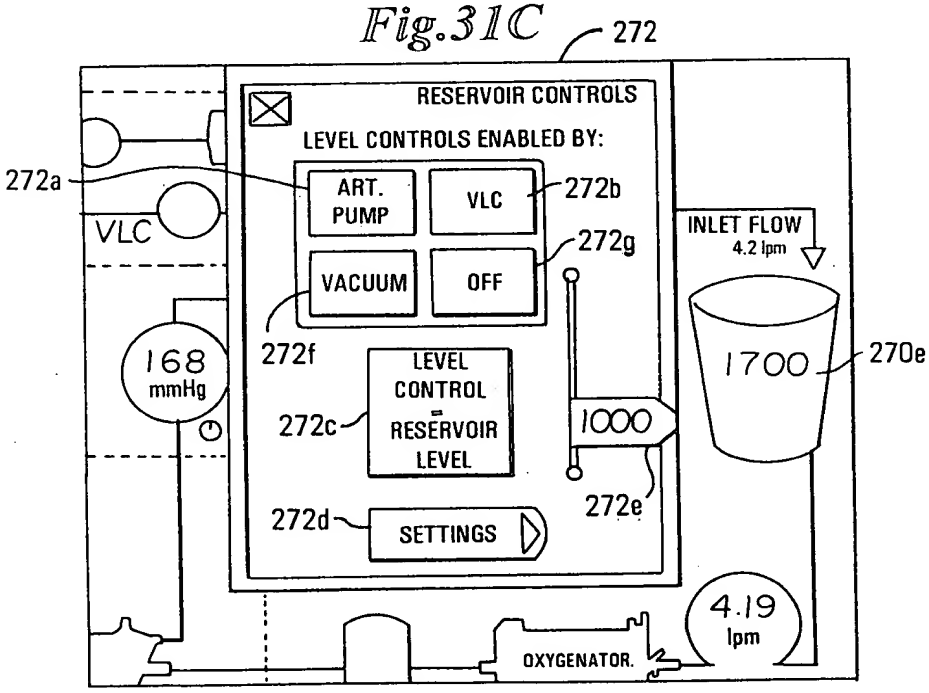


Fig.31C



Serial No. 09/963,793
Applicant: Kevin Kollar et al
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

Fig.31D

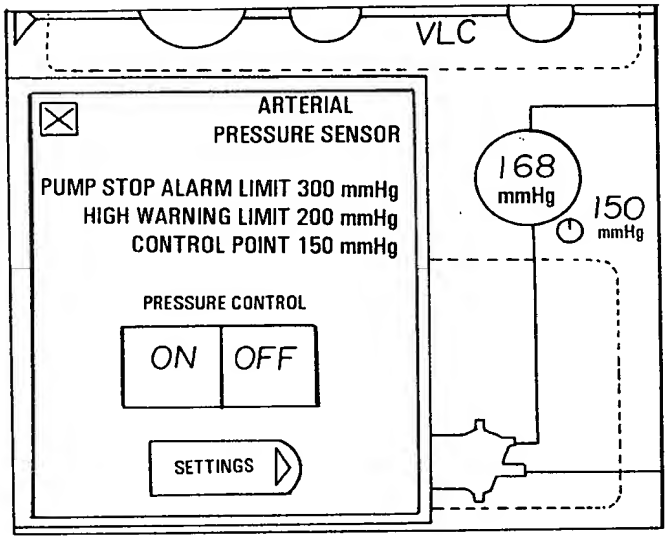


Fig.31E

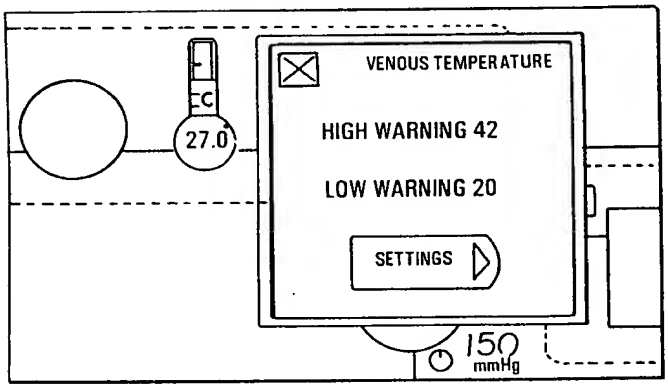
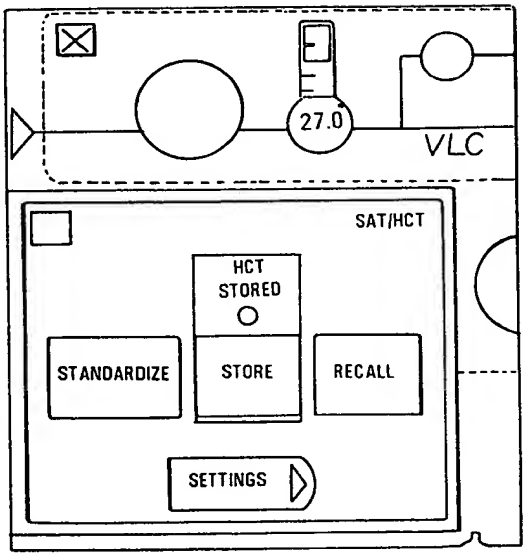


Fig.31F



Serial No. 09/963,793
Applicant: Kevin Kollar et
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

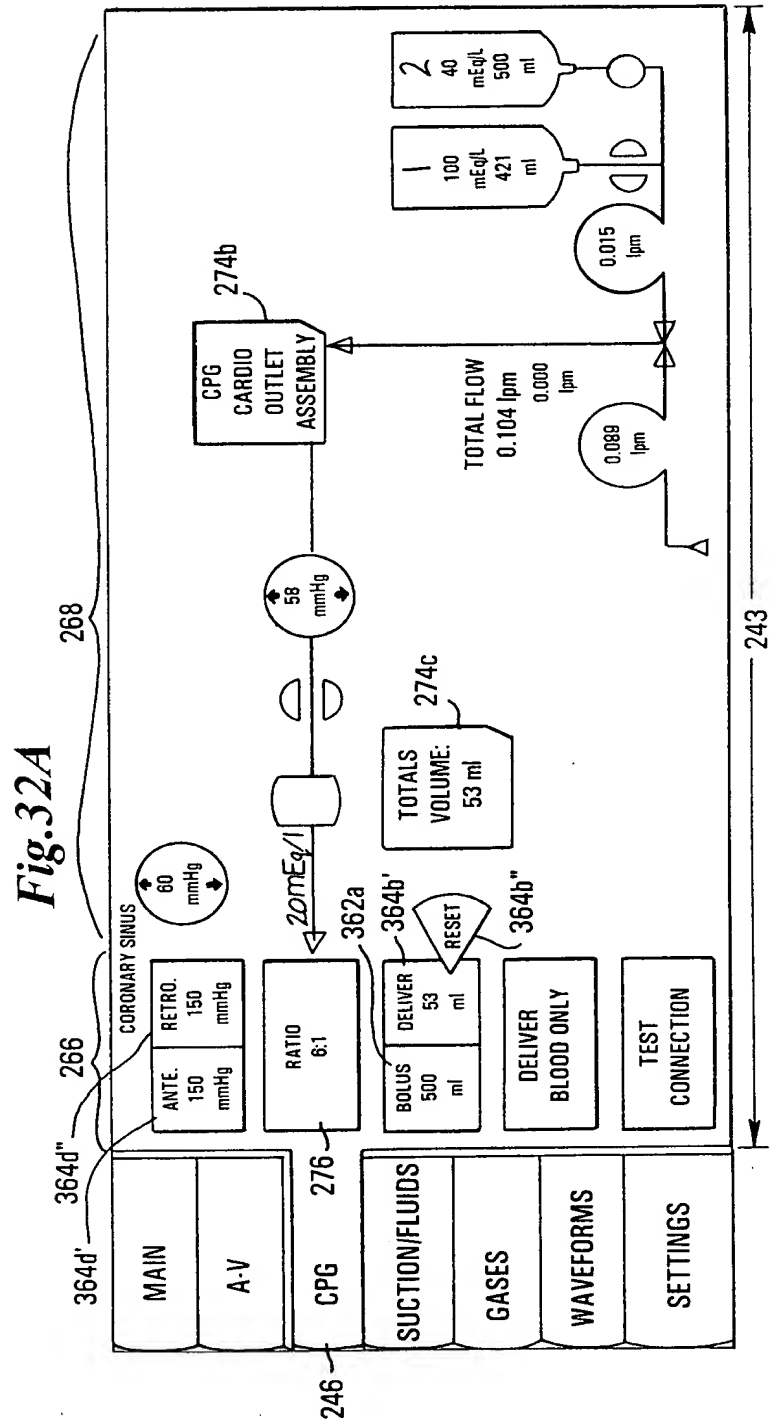


Fig.32A

Serial No. 09/963,793
Applicant: Kevin Kollar et
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

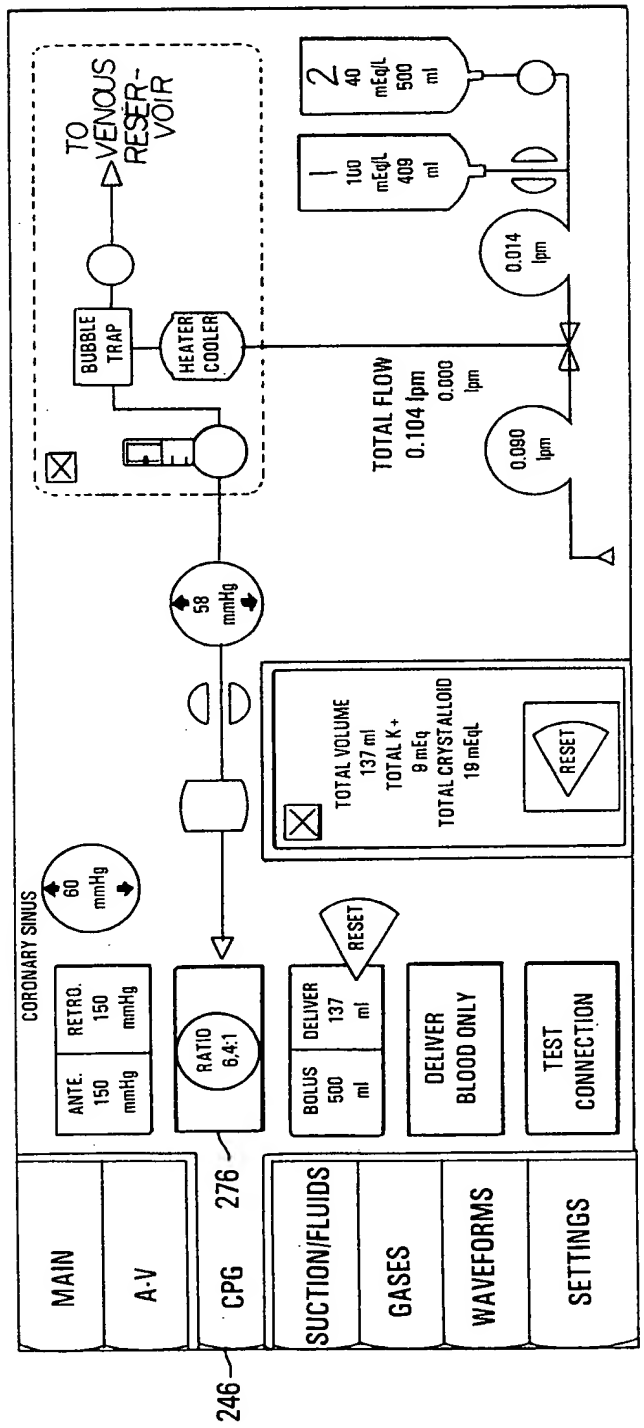


Fig.32B

Serial No. 09/963,793
Applicant: Kevin Kollar et a[redacted]
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

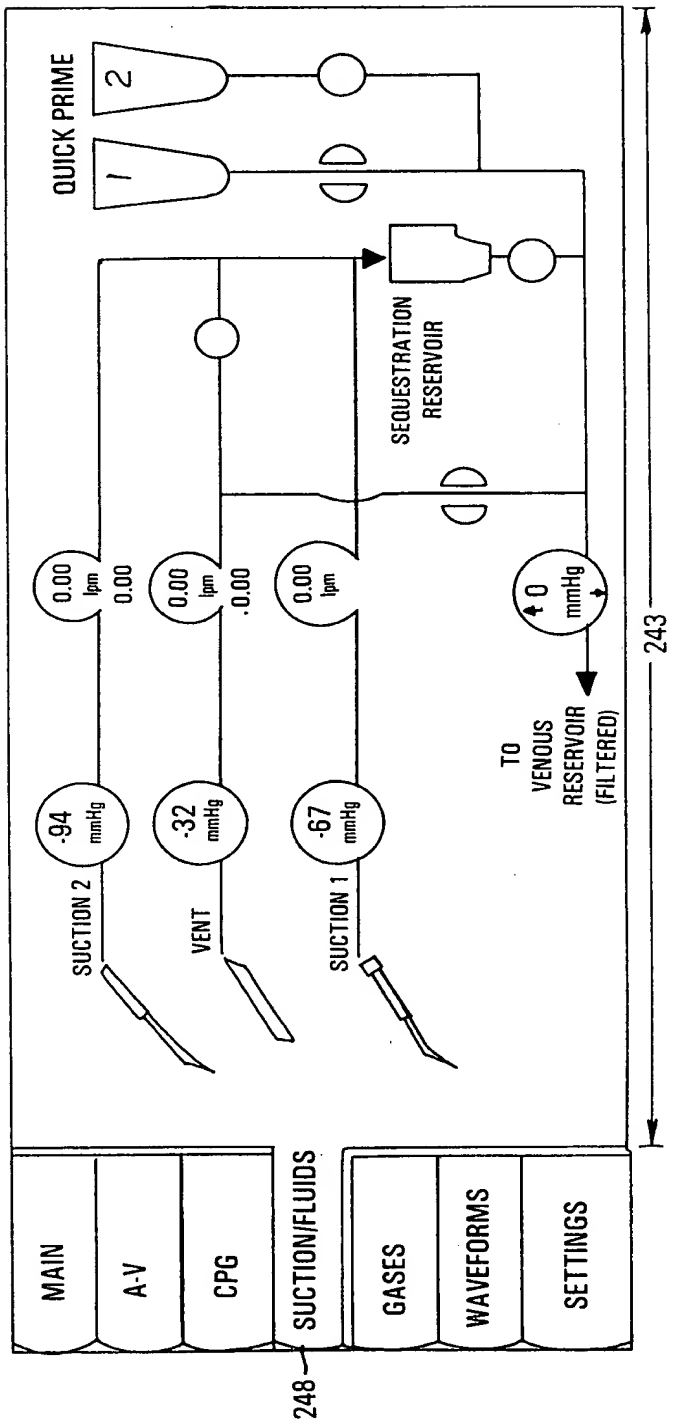


Fig.32C

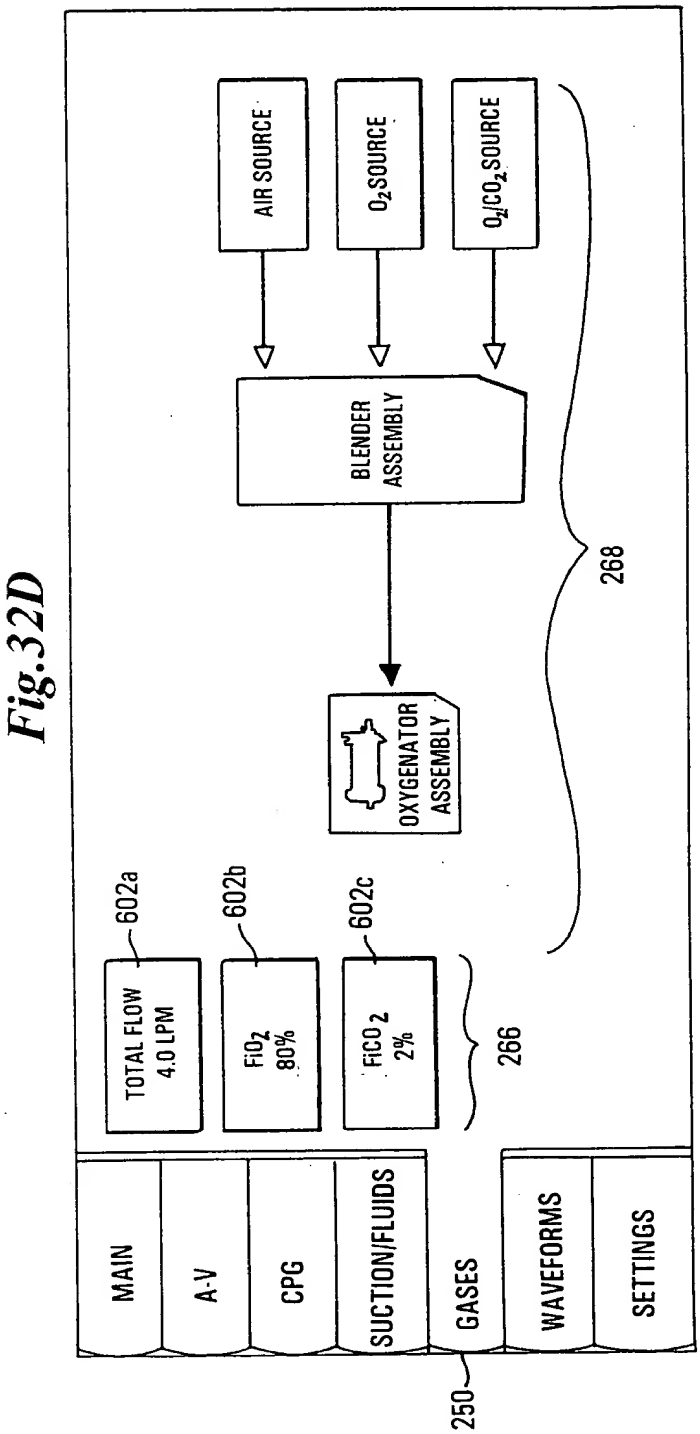

AIR SOURCE
O_2 SOURCE
O_2/CO_2 SOURCE
BLENDER ASSEMBLY
OXYGENATOR ASSEMBLY
268
602a
602b
602c
TOTAL FLOW 4.0 LPM
FiO_2 80%
$FiCO_2$ 2%
266
MAIN
A-V
CPG
SUCTION/FLUIDS
GASES
WAVEFORMS
SETTINGS
250

Fig.32D

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

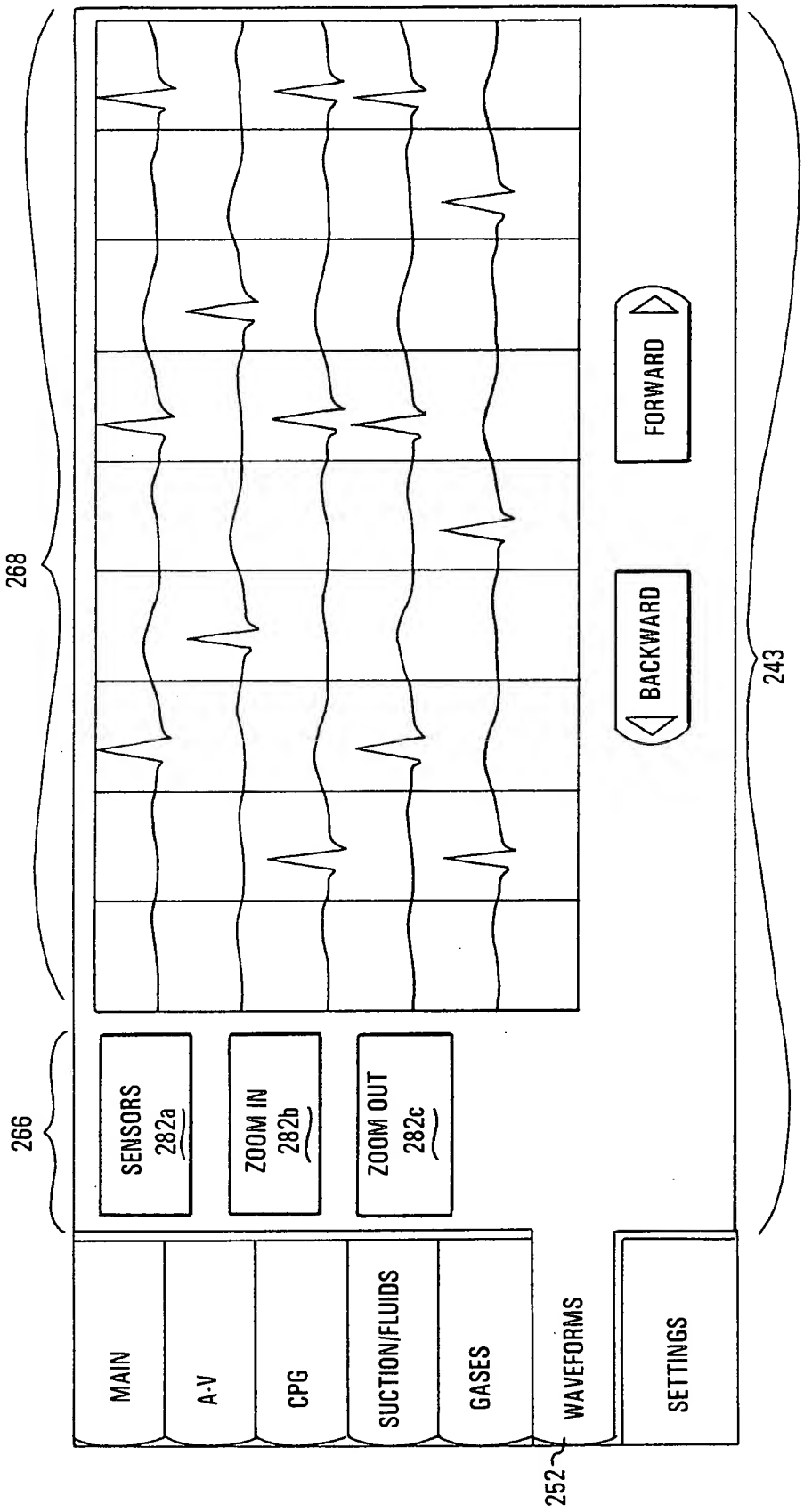


Fig. 32E

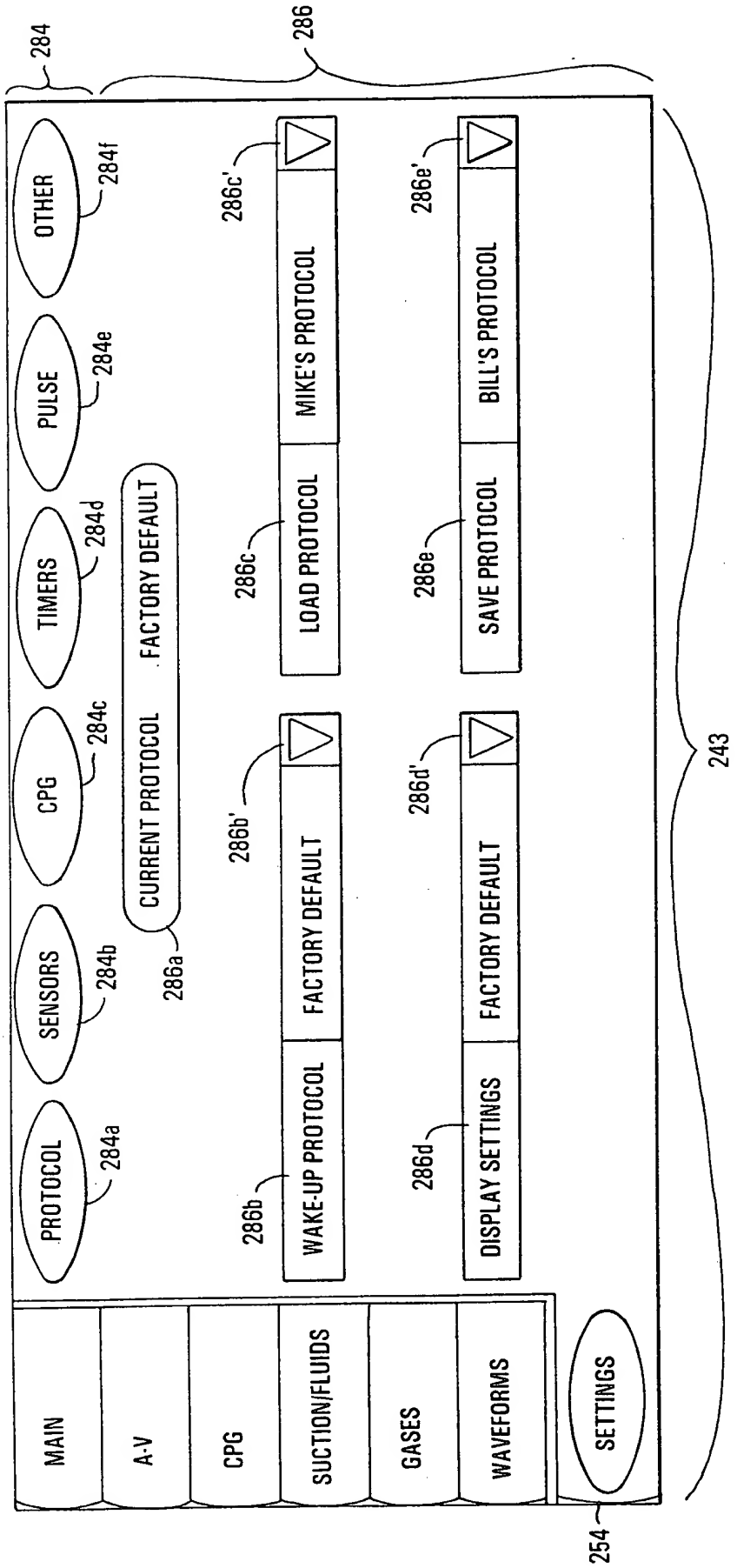

284
286
PROTOCOL
284a
SENSORS
284b
CPG
284c
TIMERS
284d
PULSE
284e
OTHER
284f
CURRENT PROTOCOL
FACTORY DEFAULT
286a
286b'
286c'
286d'
286e'
286b
WAKE-UP PROTOCOL
FACTORY DEFAULT
286c
LOAD PROTOCOL
MIKE'S PROTOCOL
286d
DISPLAY SETTINGS
FACTORY DEFAULT
286e
SAVE PROTOCOL
BILL'S PROTOCOL
MAIN
A-V
CPG
SUCTION/FLUIDS
GASES
WAVEFORMS
SETTINGS
243
254

Fig.33A

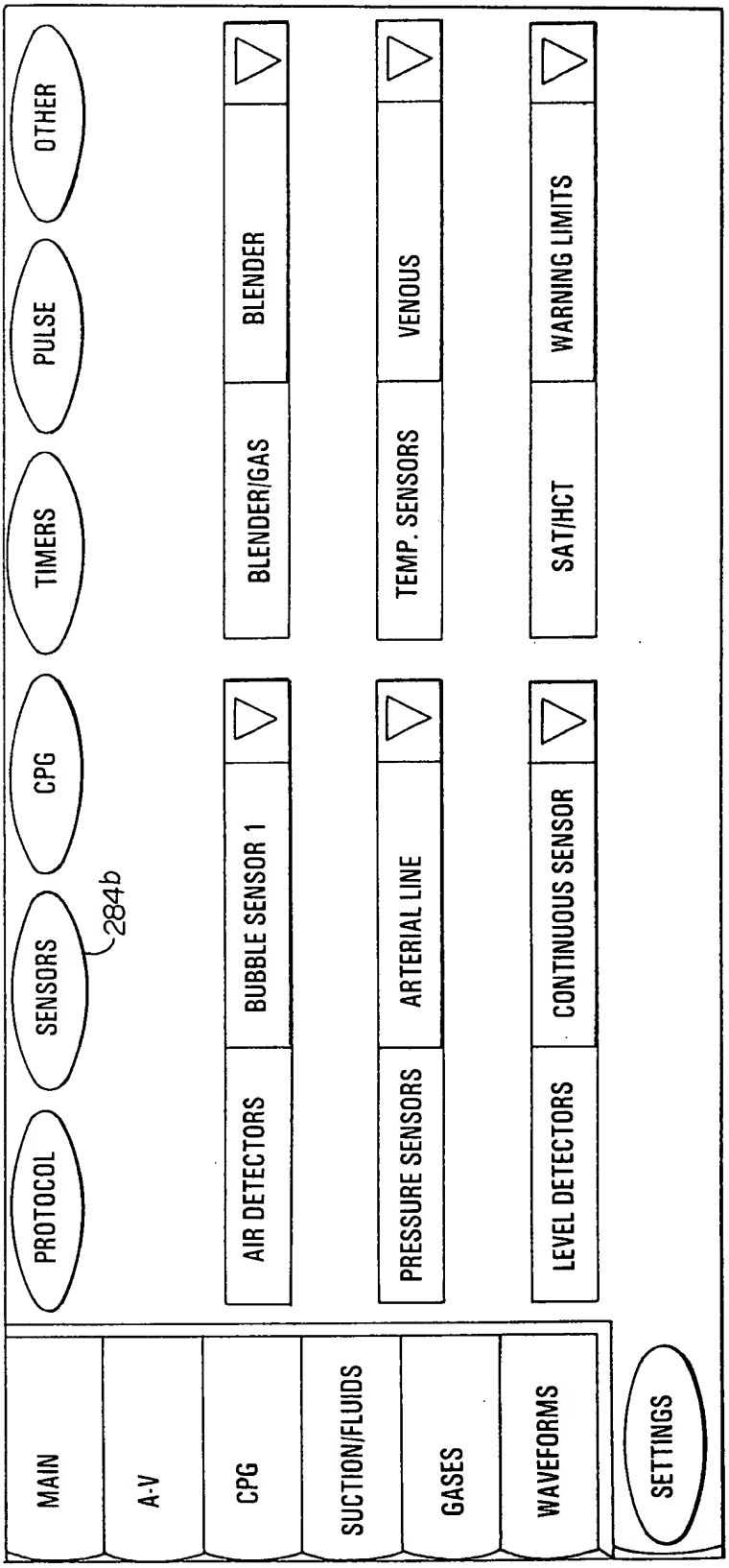


Fig.33B

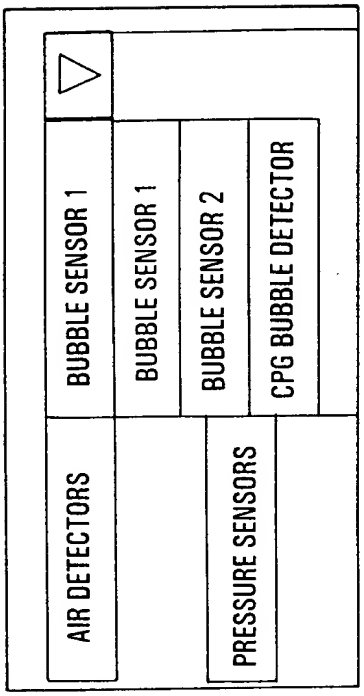


Fig.33C

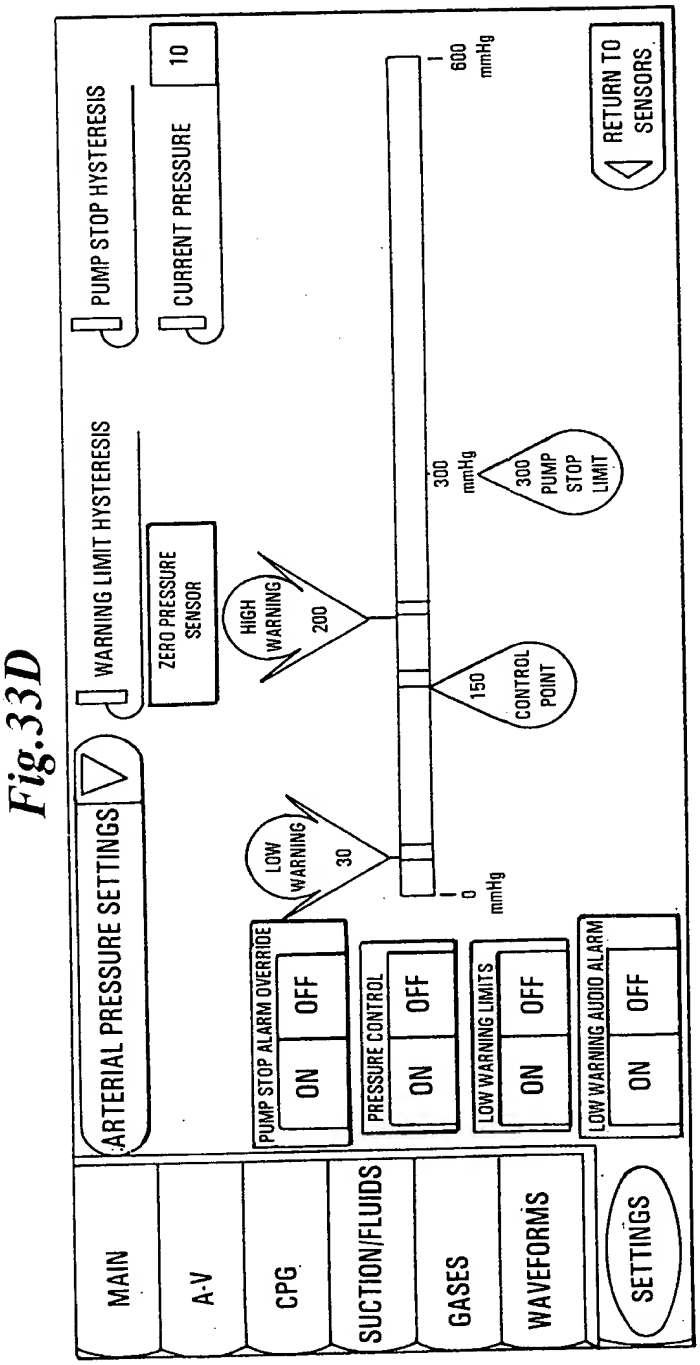

MAIN
A-V
CPG
SUCTION/FLUIDS
GASES
WAVEFORMS
SETTINGS
ARTERIAL PRESSURE SETTINGS
WARNING LIMIT HYSTERESIS
PUMP STOP HYSTERESIS
ZERO PRESSURE SENSOR
CURRENT PRESSURE
10
HIGH WARNING
200
LOW WARNING
30
300 mmHg
300 PUMP STOP LIMIT
150 CONTROL POINT
0 mmHg
600 mmHg
RETURN TO SENSORS
PUMP STOP ALARM OVERRIDE
ON
OFF
PRESSURE CONTROL
ON
OFF
LOW WARNING LIMITS
ON
OFF
LOW WARNING AUDIO ALARM
ON
OFF

Fig.33D

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

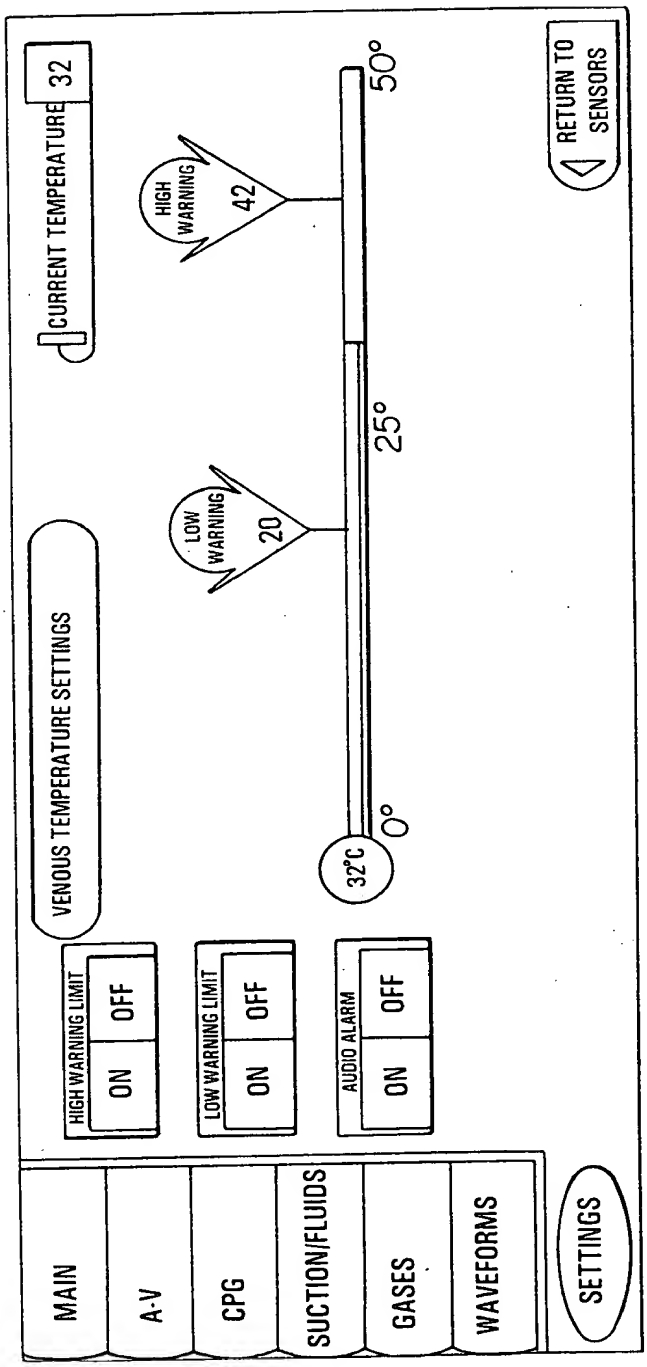


Fig. 33E

Serial No. 09/963,793
Applicant: Kevin Kollar et al.
Attorney Docket: CV0291US
Attorney: Terry L. Wiles
Telephone: (612) 334-8992

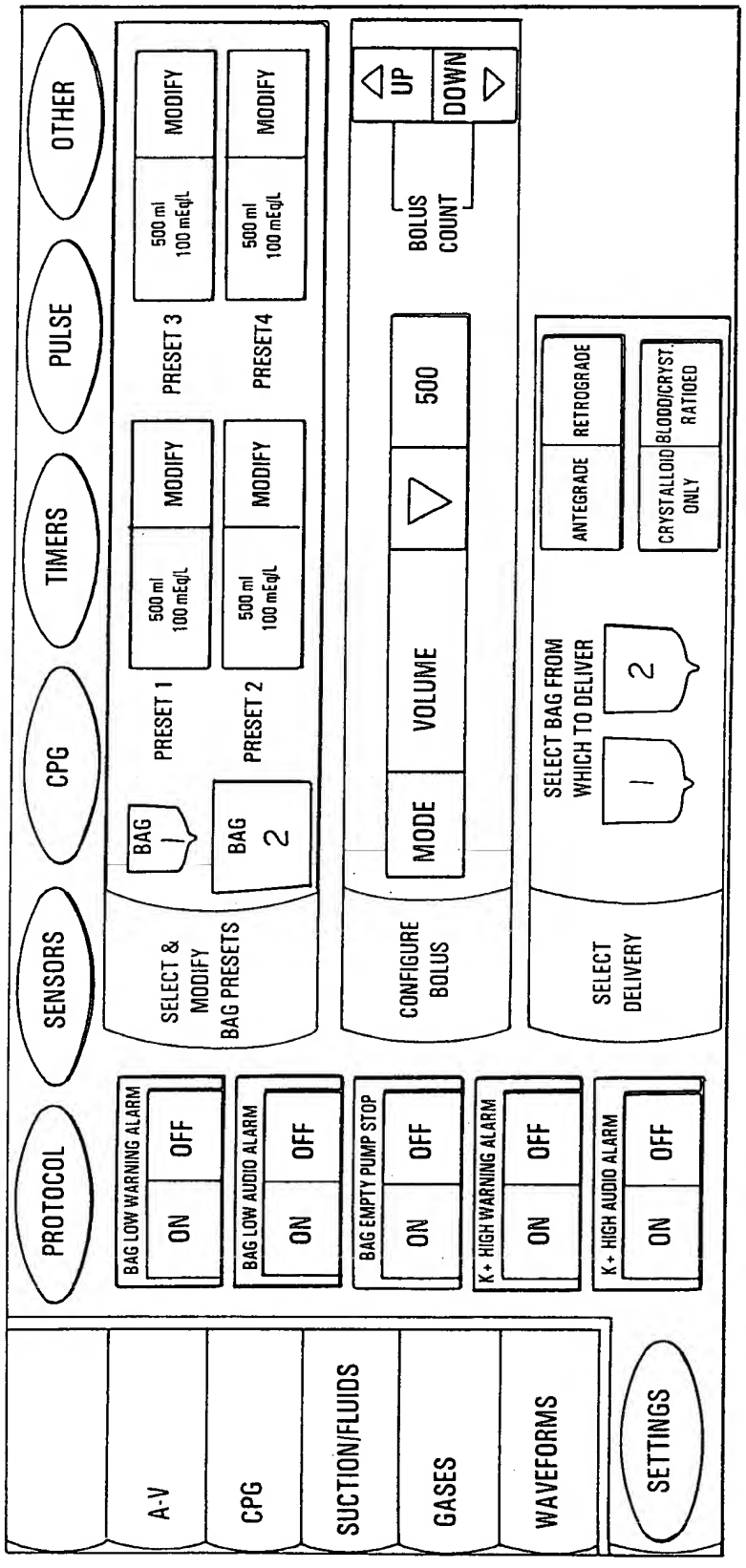


Fig.33F